

University of Pennsylvania  
School of Nursing  
Course Syllabus  
Summer 2013

**TITLE: N 681 Applied Physiology for Nurse Anesthetists I**

**COURSE UNITS: 1 cu**

**CATALOG DESCRIPTION:**

This course provides an in-depth analysis of the anatomy, physiology and pathophysiology of the respiratory system and related anesthesia implications. The concepts of pulmonary mechanics, ventilation and perfusion as they relate to oxygen and anesthetic delivery and metabolism are examined. The effects of compromised pulmonary function and implications for the patient and anesthesia plan are reviewed. The effect of surgery and anesthesia on the respiratory system will be emphasized.

**PLACEMENT: Summer I/II Year I**

**FACULTY: Joseph R. Libonati, Ph.D.**  
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**PRE-REQUISITE(S):** Completion of undergraduate courses that include Biochemistry, Nutrition, Anatomy and Physiology or permission of the instructor

**CO-REQUISITE(S): None**

**COURSE OVERVIEW:**

Fundamental concepts of pulmonary physiology from the cell to the organ level are reviewed, framing a foundation of normal physiology before proceeding to pathophysiology content. Advanced knowledge of pulmonary system in health and disease will be presented from the physiological perspective. Clinical application of this knowledge will be integrated by anesthesia faculty.

**COURSE OBJECTIVES:**

1. To introduce students to the scientific principles underlying the advanced study of respiratory physiology and pathophysiology.
2. To promote development of students' quantitative and qualitative problem-solving skills and diagnostic reasoning based on pathophysiological principles.
3. To provide self-directed learning experiences that will equip the students with the vocabulary and comprehension of respiratory physiology and alterations of physiology in the context of common respiratory disease processes.
4. To integrate physiology and pathophysiology of the respiratory system with clinical applications of this knowledge in anesthesia practice.
5. To analyze the biophysical properties of the respiratory unit (lungs and chest wall) with respect to static and dynamic compliance, lung volumes, airway resistance, and alterations of these properties in health and disease.
6. To evaluate the principles underlying solubility of gas molecules in blood plasma and transport of these molecules in the circulation, focusing on oxygen and carbon dioxide as well as inhaled anesthetics.

**TEACHING METHODS:**

Lecture, textbook readings, discussion of research articles, audiovisual materials, assignments, course handouts.

**EVALUATION METHODS:**

Exam #1	33.3%
Exam #2	33.3%
Exam #3	33.3%

**GRADING POLICY:**

A+ 97-100	B+ 87-89	C+ 77-79	F 0-69
A 93-96	B 83-86	C 73-76	
A- 90-92	B- 80-82	C- 70-72	

Rounding will be done as follows:

Grades of .5 and above will be rounded up to the next whole number

Grades of .4 or less will be rounded down to the next whole number

**Should a student be found responsible for cheating in this course, their grade for the course will be a failure. The University Code of Academic integrity will be followed in this course (see below). It is also available on Blackboard and the student handbook.**

## ***Code of Academic Integrity***

Since the University is an academic community, its fundamental purpose is the pursuit of knowledge. Essential to the success of this educational mission is a commitment to the principles of academic integrity. Every member of the University community is responsible for upholding the highest standards of honesty at all times. Students, as members of the community, are also responsible for adhering to the principles and spirit of the following Code of Academic Integrity.

### **Academic Dishonesty Definitions**

Activities that have the effect or intention of interfering with education, pursuit of knowledge, or fair evaluation of a student's performance are prohibited. Examples of such activities include but are not limited to the following definitions:

A. Cheating: using or attempting to use unauthorized assistance, material, or study aids in examinations or other academic work or preventing, or attempting to prevent, another from using authorized assistance, material, or study aids.

Example: using a cheat sheet in a quiz or exam, altering a graded exam and resubmitting it for a better grade, etc.

B. Plagiarism: using the ideas, data, or language of another without specific or proper acknowledgment. Example: copying another person's paper, article, or computer work and submitting it for an assignment, cloning someone else's ideas without attribution, failing to use quotation marks where appropriate, etc.

C. Fabrication: submitting contrived or altered information in any academic exercise. Example: making up data for an experiment, fudging data, citing nonexistent articles, contriving sources, etc.

D. Multiple submission: submitting, without prior permission, any work submitted to fulfill another academic requirement.

E. Misrepresentation of academic records: misrepresenting or tampering with or attempting to tamper with any portion of a student's transcripts or academic record, either before or after coming to the University of Pennsylvania. Example: forging a change of grade slip, tampering with computer records, falsifying academic information on one's resume, etc.

F. Facilitating academic dishonesty: knowingly helping or attempting to help another violate any provision of the Code. Example: working together on a take-home exam, etc.

G. Unfair advantage: attempting to gain unauthorized advantage over fellow students in an academic exercise. Example: gaining or providing unauthorized access to examination materials, obstructing or interfering with another student's efforts in an academic exercise, lying about a need for an extension for an exam or paper, continuing to write even when time is up during an exam, destroying or keeping library materials for one's own use., etc.

\* If a student is unsure whether his action(s) constitute a violation of the Code of Academic Integrity, then it is that student's responsibility to consult with the instructor to clarify any ambiguities. (Source: Office of the Provost, 1996)

<http://www.vpul.upenn.edu/osl/pennbook.html>

### **REQUIRED TEXTS:**

Rhoades, R.A. & Bell, D.R. (2013). *Medical Physiology: Principles for Clinical Medicine* 4<sup>th</sup> Edition. Philadelphia: Lippincott, Williams, & Wilkins.

West, J.B. (2012). *Respiratory Physiology: The Essentials* 9<sup>th</sup> Edition. Philadelphia: Lippincott, Williams, & Wilkins.

Nagelhout, J. & Zaglaniczny (2013). *Nurse Anesthesia* 5<sup>th</sup> Edition. Missouri: Elsevier Saunders.

Barash, P.G., Cullen, B.F. & Stoeling, R.K. Eds. (2013). *Clinical Anesthesia* 7<sup>th</sup> Edition. Phila., PA: Lippincott, Williams & Wilkins.

### **RECOMMENDED TEXTS:**

Morgan, E.G., Mikhail, M. S., & Murray, M.J. (2006). *Clinical Anesthesiology* 4<sup>th</sup> Ed. New York: Lange Medical Division/McGraw-Hill Companies, Inc.

McPhee, S.J., Lingappa, V.R., Ganong, W.F., Lange, J.D. *Pathophysiology of Disease: An Introduction to Clinical Medicine*, 6<sup>th</sup> Ed., New York, Lange Medical Books/McGraw-Hill, 2006. ISBN: 007144159X.

Netter, F.H., & Hanson, J.T. (2010). *Atlas of Human Anatomy*. 5th Edition. Missouri: Elsevier Saunders.

***Tuesday 1p-4p*****WEEKLY TOPICAL OUTLINE:**

Day/Time	Topic	Objectives	Readings
<b>Week 1</b> May 21, 2013  Winner	-Welcome Day -Course Overview with Syllabus -Simulation sessions information		
<b>Week 2</b> May 28, 2013  Libonati Winner	-Breathing/Metabolism Overview -Mechanics of Breathing -Breathing Resistance -Compliance  -Clinical Correlations: Respiratory failure	1-6	Nagelhout Ch. 22 & 26  West Ch. 2 & 7
<b>Week 3</b> June 4, 2013  Libonati Winner	-Pathophysiological alterations in lung biophysics -Pulmonary function tests  -Clinical Correlations: Perioperative Bronchospasm, Care of Patient with Emphysema under Anesthesia	1-6	Nagelhout Ch. 22 & 26  West Ch. 7 & 10
<b>Week 4</b> June 11, 2013  Winner	<b>Exam # 1</b>   <b><i>Simulation Lab (following Exam)</i></b> Oxygenation & Ventilation	   1-6	Exam-content covered in weeks 2-3.  Material provided.
<b>Week 5</b> June 18, 2013  Libonati Winner	-Neural control of ventilation  -Clinical Correlations: Neurologic Assessment of Ventilator-Dependent Patient	1-6	Nagelhout Ch. 22 & 26  West Ch. 8

<p><b>Week 6</b> June 25, 2013</p> <p>Libonati Winner</p>	<p>-Chemoreceptors -Diffusion of gases</p> <p>-Clinical Correlations: Inhalational agents and their effects</p>	1-6	<p>Nagelhout Ch. 8, 22 &amp; 26</p> <p>West Ch. 3</p>
<p><b>Week 7</b> July 2, 2013 <b>9a-4p</b></p> <p>Winner</p>	<p><b>Exam # 2</b></p> <p>Lecture: -Lung anatomy -Innervation of the airways</p> <p><b>Simulation Lab (following Exam)</b> Inhalational agents Ventilatory modes Emergence from Anesthesia</p>	1-6	<p>Exam- content covered in weeks 4-6.</p> <p>Nagelhout Ch. 22 &amp; 26</p> <p>West Ch. 1</p>
<p><b>Week 8</b> July 9, 2013 <b>9a-4p</b></p> <p>Libonati Winner</p>	<p>-Regulation pulmonary blood flow -Zones of the lung - Lung ventilation and perfusion -Dead space, shunt -V/Q matching</p> <p>Clinical Correlation: - Pulmonary Hypertension</p>	1-6	<p>Nagelhout Ch. 8, 17, 22 &amp; 26</p> <p>West Ch. 4, 5, &amp; 6</p>
<p><b>Week 9</b> July 16, 2013</p> <p>Libonati Winner</p>	<p>-Gas transport in the blood -Acid-base balance -Integration of concepts</p> <p>-Clinical Correlations: Acid /Base scenario in OLV</p>	1-6	<p>Nagelhout Ch. 8, 22 &amp; 26</p> <p>West Ch. 6</p>
<p><b>Week 10</b> July 23, 2013</p> <p>Winner</p>	<p><b>Exam # 3</b></p>		<p>Exam- content covered in weeks 7, 8 &amp; 9.</p>
<p><b>Week 11</b> July 30, 2013</p> <p>Winner</p>	<p><b>OR Orientation Week</b> <b>Simulation Lab</b></p>		

<b>Week 12</b> August 9, 2013	<b>Semester End (No class)</b> <b>AANA National Meeting</b> <b>August 10-14th</b>		

**TOTAL NUMBER OF THEORY HOURS: 45**

**TOTAL NUMBER OF CLINICAL HOURS: 0**