

## **Advanced Cardiopulmonary Anatomy and Physiology (RSPT 1240)**



**Credit:** 2 semester credit hours (2 hours lecture, 1 hour lab)

**Prerequisite:** RSPT 1201

**Co-requisite:** RSPT 1213, RSPT 1329, RSPT 1207, RSPT 2210, RSPT 1325

### **Course Description**

Provides an advanced presentation of anatomy and physiology of the cardiovascular and pulmonary system.

### **Required Textbook and Materials**

1. Cardiopulmonary Anatomy and Physiology by DesJardin- 7<sup>th</sup> Edition (ISBN # 978-13-37794909)
2. #2 pencils
3. Package of #882 scantrons
4. Calculator- not one within your phone or other electronic device.

### **Course Objectives**

Upon completion of the course the student will be able to:

1. Describe and explain normal cardiopulmonary anatomy and physiology.
2. Describe/explain and use calculated values to assess/identify the functioning of the cardiopulmonary system.

### **Course Outline**

- A. Anatomy and physiology of the respiratory system
  1. Upper airway
    - a. Structure
    - b. Function
  2. Lower airway
    - a. Tracheobronchial tree ( cartilaginous and non-cartilaginous)
      1. Structure
      2. Function
  3. Lung segments
  4. Bronchial blood supply
  5. Sites of gas exchange
  6. Pulmonary vascular system
  7. Lymphatic system
  8. Neural control
  9. The thorax

- 10. Muscles of ventilation
- 11. Accessory muscles of ventilation
- B. Ventilation
  - 1. Pressure differences
  - 2. Diaphragm
  - 3. Compliance
  - 4. Hooks law
  - 5. Surface tension
  - 6. Poiseuille's Law
  - 7. Airway resistance
  - 8. Ventilatory Patterns
  - 9. Alveolar ventilation
  - 10. Deadspace ventilation
- C. Diffusion of Pulmonary gases
  - 1. Gas Laws
  - 2. Atmospheric gases
  - 3. Partial Pressure
  - 4. PAO<sub>2</sub>
  - 5. Movement across the alveolar-capillary membrane
  - 6. Perfusion limited
  - 7. Diffusion limited
  - 8. Conditions that decrease the rate of gas diffusion
- D. Anatomy and physiology of the circulatory system
  - 1. The blood
  - 2. The heart
    - a. Structure
    - b. Function
    - c. Blood supply
    - d. Blood flow thru
    - e. Cardiac output
  - 3. Pulmonary and systemic vascular system
    - a. Neural control
    - b. Receptors
    - c. Blood pressure
    - d. Mean arterial blood pressure
    - e. Vascular resistance
  - 4. Distribution of blood flow
- E. Oxygen transport
  - 1. Oxygen dissolved in blood
    - a. Calculation
    - b. Normal/abnormal value
  - 2. Oxygen bound to hemoglobin
    - a. Calculation
    - b. Normal/abnormal value
  - 3. Total oxygen content
    - a. arterial

- b. venous
  - 4. Content difference
    - a. Normal
    - b. Abnormal
    - c. Factors that increase and decrease  $C(a-v)O_2$
  - 5. Oxyhemoglobin dissociation curve
    - a. Factors affecting affinity
    - b. P50
  - 6. Oxygen consumption
    - a. Calculation
    - b. Factors affecting
  - 7. Oxygen extraction ratio
    - a. Calculation
    - b. Factors affecting
  - 8. Saturation
    - a. Arterial
    - b. Venous
      - 1. Factors increasing  $SvO_2$
      - 2. Factors decreasing  $SvO_2$
  - 9. Shunting
    - a. Anatomic shunts
    - b. Capillary shunts
    - c. Calculation of shunts
  - 10. Hypoxia
    - a. Types of hypoxia
    - b. Causes of hypoxia
  - 11. Cyanosis
  - 12. Polycythemia
- F. Ventilation/ perfusion relationships
- 1. Normal pulmonary capillary blood flow
  - 2. Normal alveolar ventilation
  - 3. Ventilation perfusion ratio
    - a. Increased ratio
    - b. Decreased ratio
  - 4. How the V/Q ratio affects capillary gases
  - 5. How respiratory disorders affect the V/Q ratio
- G. Control of Ventilation
- 1. The medulla oblongata
    - a. Dorsal respiratory groups
    - b. Ventral respiratory groups
  - 2. The pontine respiratory centers on the medulla oblongata
  - 3. Central Chemoreceptors
    - a. Location
    - b. Stimulation
  - 4. Peripheral Chemoreceptors

- a. Location
- b. Stimulation
- 5. Reflexes
  - a. Hering-breuer
  - b. Deflation
  - c. Irritant
  - d. Juxtapulmonary-capillary receptors
  - e. Peripheral proprioceptor reflexes
  - f. Hypothalamic control
  - g. Cortical control
  - h. Aortic and carotid sinus baroreceptors
- H. Carbon dioxide transport and acid- base balance
  - 1. Carbon dioxide transport in the plasma
  - 2. Carbon dioxide transport in the red blood cell
  - 3. Carbon dioxide elimination at the lungs
  - 4. Carbon dioxide dissociation curve
  - 5. Acid base balance
  - 6. Buffer systems
  - 7. The respiratory system effects on acid base balance
    - a. Respiratory acidosis
      - 1. Interpretation
      - 2. Causes
      - 3. Compensation
    - b. Respiratory alkalosis
      - 1. Interpretation
      - 2. Causes
      - 3. Compensation
  - 8. The renal system effects on the acid base balance
    - a. Metabolic acidosis
      - 1. Interpretation
      - 2. Causes
      - 3. Compensation
    - b. Metabolic alkalosis
      - 1. Interpretation
      - 2. Causes
      - 3. Compensation
- I. Renal failure and it's effects of the cardiopulmonary system
  - 1. The kidneys
    - a. Function
    - b. Structure
    - c. Urine formation
  - 2. Regulation of electrolytes
  - 3. Renal failure
    - a. Causes
    - b. Classification
    - c. Cardiopulmonary disorders caused by renal failure

## Grade Scale

90 – 100	A
80 – 89	B
77 – 79	C
68 – 76	D
0 – 67	F

## Course Evaluation

Final grades will be calculated according to the following criteria:

4-6 Exams	85%
Assignments, pop quiz and homework	15%

## Course Policies

1. No food or drink, or use of tobacco products in class
2. Beepers, telephones, headphones, and other electronic devices must be turned off while in class. No cell phones or electronic devices are to be out during an exam. This will result in a Zero for that exam and the Respiratory Care Handbook will be utilized for disciplinary action. All personal items will be placed at the front of the classroom and cell phones will be placed on presentation desk.
3. No children allowed in the classroom
4. No late assignments will be accepted
5. Abide by LIT policies
6. Abide by policies within the Respiratory Care Handbook
7. Abide by instructor specific policies; this will be distributed on the first class day.
8. Exam dates will be distributed the first class day.
9. Electronic communication will be thru your LIT e-mail.
10. Homework and assignments will be handed out in class. They are due at the beginning of class on the date they are due.

## Technical Requirements (for courses using Blackboard)

The latest technical requirements, including hardware, compatible browsers, operating systems, software, Java, etc. can be found online at:

[https://help.blackboard.com/en-](https://help.blackboard.com/en-us/Learn/9.1)

[us/Learn/9.1](https://help.blackboard.com/en-us/Learn/9.1) 2014 04/Student/015 Browser Support/015 Browser Support Policy

A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of the online technology and resources.

## Disabilities Statement

The Americans with Disability Act of 1990 and Section 504, Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights

for persons with disabilities. LIT provides reasonable accommodations as defined in the Rehabilitation Act of 1973, Section 504 and the American with Disability Act of 1990, to students with a diagnosed disability. The Special Populations Office is located in the Eagles' Nest Room 129 and helps foster a supportive and inclusive educational environment by maintaining partnerships with faculty and staff, as well as promoting awareness among all members of the Lamar Institute of Technology community. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409)839-2018. You may also visit the online resource at [Special Populations - Lamar Institute of Technology \(lit.edu\)](http://www.lit.edu/special-populations)

### **Student Code of Conduct Statement**

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at [www.lit.edu](http://www.lit.edu) or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document

### **STARFISH**

LIT utilizes an early alert system called Starfish. Throughout the semester, you may receive emails from Starfish regarding your course grades, attendance, or academic performance. Faculty members record student attendance, raise flags and kudos to express concern or give praise, and you can make an appointment with faculty and staff all through the Starfish home page. You can also login to Blackboard or MyLIT and click on the Starfish link to view academic alerts and detailed information. It is the responsibility of the student to pay attention to these emails and information in Starfish and consider taking the recommended actions. Starfish is used to help you be a successful student at LIT.

<https://lit.edu/student-success/starfish>