

RSPT 1240 Advanced Cardiopulmonary Anatomy and Physiology

CREDIT

2 Semester Credit Hours (2 hours lecture, 1 hours lab)

MODE OF INSTRUCTION

Face to Face

PREREQUISITE/CO-REQUISITE:

Prerequisite: RSPT 1201, RSPT 1213

Co-Requisite: RSPT 1310, RSPT 1325, RSPT 1160,

COURSE DESCRIPTION

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

COURSE OBJECTIVES

Upon completion of this course, the student will be able to

- Explain advanced concepts of cardiopulmonary anatomy and physiology;
- Describe the neurological control of breathing
- Differentiate ventilation/perfusion concepts, concepts, to include acid-base balance with classification
- Summarize principles of gas

INSTRUCTOR CONTACT INFORMATION

Instructor: Marla Dixon

Email: Midoxn@lit.edu

Office Phone: 409-247-4942

Office Location: Gateway (3871 Stagg Drive) Office # 113

Office Hours: Posted within Starfish

REQUIRED TEXTBOOK AND MATERIALS

1. Cardiopulmonary Anatomy and Physiology: Essentials of Respiratory Care by Des Jardins – 7th Edition (ISBN13 # 978-1-337-79490-9)



1. #2 Pencils
2. Package of # 882 scantrons
3. Calculator – separate from your phone or other electronic device

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. Dead space ventilation
- C. Diffusion of Pulmonary gases
 2. Gas Laws
 3. Atmospheric gases
 4. Partial Pressure
 5. PAO₂
 6. Movement across the alveolar-capillary membrane

7. Perfusion limited
 8. Diffusion limited
 9. 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 SvO₂
 2. Factors decreasing SvO₂
 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 its 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

ATTENDANCE POLICY

- It is the student's responsibility to familiarize his or herself with the LIT Student Handbook and the Respiratory Care program student handbook.
- Violation of the policies listed in the LIT Student Handbook and/or the Respiratory Care program student handbook will result in appropriate action being taken. .

Attendance: Attendance is expected. Students are allowed 2 absences per semester, with or without a Dr.'s excuse. Each absence in excess of the 2 allotted absences will result in a 10% reduction, per absence, in the student's final class grade. Example: 3 absences = 10% reduction in final class grade, 4 absences = 20% reduction in final class grade, etc. Deductions as a result of excessive absences, will be applied to the student's final class grade at the end of the semester.

Your attendance is the biggest predictor of your success. If you do not attend class, you are missing very valuable information. Attendance will be recorded both in the classroom and in the lab. Absences in lab will result in a grade of 0 for that lab day. Tests will include both textbook material and material presented in class.

If absences seriously interfere with performance, the instructor may recommend, to the Department Chair, that the student be dropped from the course.

Absences resulting from extenuating circumstances will be evaluated by the program Director and/or Director of Clinical Education on a case by case basis. Proper documentation will be required to demonstrate the nature of the extenuating circumstance.

Examples of extenuating circumstances, and documentation, include:

- Hospitalization of an immediate family member (Hospital/Physician documentation must be provided)
- Death of an immediate family member (Memorial Pamphlet must be provided)

Tardiness: Punctuality is expected. 3 tardies in a semester will be considered as a 1-day absence.

You must notify the instructor via phone call, PRIOR to missing an exam. Failure to notify instructor of an absence prior to the start of the exam will result in a grade of 0 for the missed exam. There will be no makeup exams or lab assignments if you fail to notify the instructor prior to a missed exam.

Make-Up Exams: Make up exams will be taken on the first class day that the student returns following an absence. Make-up exams will be administered immediately at the beginning of the class on the day of return.

Homework Assignments: Homework assignments will be due immediately at the start of class. Late work (work turned in after the start of class) will not be accepted. If you are absent on the day a

homework assignment is due, it is your responsibility to ensure that your work is emailed to the instructor prior to the start of class on the day of your absence.

Pop Quizzes: Pop Quizzes will be administered at the start of class. Any student who arrives tardy to class, after the Pop Quiz has been distributed, will receive a 0 grade for that pop quiz.

DROP POLICY

If you wish to drop a course, you are responsible for initiating and completing the drop process by the specified drop date as listed on the [Academic Calendar](#). If you stop coming to class and fail to drop the course, you will earn an “F” in the course.

STUDENT EXPECTED TIME REQUIREMENT

For every hour in class (or unit of credit), students should expect to spend at least two to three hours per week studying and completing assignments. For a 3-credit-hour class, students should prepare to allocate approximately six to nine hours per week outside of class in a 16-week session OR approximately twelve to eighteen hours in an 8-week session. Online/Hybrid students should expect to spend at least as much time in this course as in the traditional, face-to-face class.

COURSE CALENDAR

DATE	TOPIC	READINGS (Due on this Date)	ASSIGNMENTS (Due on this Date)
Week 1: 8/24 - 8/26	LEC: Anatomy and Physiology of the Respiratory System LAB: Round table discussion of upper airway problems.	Des Jardins: Chapter 1 Egan: Chapter 9	Homework Week 1: The Anatomy & Physiology of the Respiratory System – Due 8/26
Week 2: 8/31 – 9/2	LEC: Anatomy and physiology of the Respiratory System LAB: Identifying Lung lobes and segments	Des Jardins: Chapter 1 Egan Chapter 9	
Week 3: 9/7 - 9/9	Exam #1 LEC: Ventilation LAB: Calculation of PAo ₂ , P(A-a) O ₂	Des Jardins: Chapter 2 Egan Chapter 11	*9/7 – Labor Day Holiday : No classes 9/9 – EXAM 1 Homework Week 3: Calculate PAO ₂ , P(A-a)O ₂ , PaO ₂ /PAO ₂ – Due 9/14
Week 4: 9/14 – 9/16	LEC: Ventilation cont. LAB: Calculate Cao ₂ , Cvo ₂ , C(a-v) O ₂	Des Jardins: Chapter 2 Egan Chapter 12	Homework Week 4: Calculate CaO ₂ – Due 9/16

Week 5: 9/21 – 9/23	LEC: Diffusion / Oxygen transport LAB: Calculate compliance (Cs, Cd)	Des Jardins: Chapter 4 & Chapter 6 Egan Chapter 12	Homework Week 5 : Compliance Review – Due 9/23
Week 6: 9/28 – 9/30	LEC: Oxygen transport LAB: Calculate RAW	Des Jardins: Chapter 6 Reference book of Egan Chapter 12	Homework Week 6: Compliance & Resistance Scenarios – Due 9/30
Week 7: 10/5 – 10/7	LEC: Oxygen transport / Exam #2 LAB: Calculate Qt, Qs/Qt	Des Jardins: Chapter 6 Reference book Egan Chapter 12	10/7 - EXAM #2
Week 8: 10/12 – 10/14	LEC: Ventilation and perfusion LAB: Calculate V/QVe,	Des Jardins: Chapter 8 Reference book Egan Chapter 15	Homework Week 8: Calculate Normal Vt – Due 10/14
Week 9: 10/19 – 10/22	LEC: Control of ventilation LAB: Calculate Ve, Vd/Vt	Des Jardins: Chapter 9 Reference book Egan Chapter 15	Homework Week 9: Calculate Ve, Vd, etc. – Due 10/21
Week 10: 10/26 – 10/28	LEC: Anatomy and physiology of the circulatory system LAB: Identifying blood flow and coronary vessels	Des Jardins: Chapter 5 Reference book Egan Chapter 10	
Week 11: 11/2 – 11/4	LEC: Anatomy and Physiology of the Circulatory System / Exam #3 LAB: Calculate Qt,MAP,PVR,SVR	Des Jardins: Chapter 5 & Chapter 15 Reference book Egan Chapter Egan Chapter 10	11/4 - EXAM #3 Homework Week 11: Hemodynamics – Due 11/4
Week 12: 11/9 – 11/11	LEC: Renal failure LAB: Calculate anion gap	Des Jardins: Chapter 16 Reference book Egan Chapter 14	Homework Week 12: Renal/Kidney – Due 11/11
Week 13: 11/16 – 11/18	LEC: Carbon Dioxide transport LAB: PH balance	Des Jardins: Chapter 6 & Chapter 7 Reference book Egan Chapter 14	
Week 14: 11/23 – 11/25	LEC: Acid base Balance LAB: ABG interpretation	Des Jardins: Chapter 7 Reference book Egan Chapter 14	11/25-11/27 – Thanksgiving Holiday: No classes
Week 15: 11/30 – 12/2	LEC: Acid base Balance LAB: ABG interpretation	Des Jardins: Chapter 7 Reference book Egan Chapter 14	Homework Week 15: ABGs Test your Knowledge & Additional ABG Practice – Due 12/2

Week 16: 12/7	Final (Exam 4)		12/7 – FINAL EXAM
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COURSE EVALUATION

Final grades will be calculated according to the following criteria:

- b. 4- 6 Exams 85%
- c. Assignments/pop quiz/Homework 15%

GRADING SCALE

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

LIT does not use +/- grading scales

ACADEMIC DISHONESTY

Students found to be committing academic dishonesty (cheating, plagiarism, or collusion) may receive disciplinary action. Students need to familiarize themselves with the institution's Academic Dishonesty Policy available in the Student Catalog & Handbook at <http://catalog.lit.edu/content.php?catoid=3&navoid=80#academic-dishonesty>.

TECHNICAL REQUIREMENTS

The latest technical requirements, including hardware, compatible browsers, operating systems, etc. can be online at <https://lit.edu/online-learning/online-learning-minimum-computer-requirements>. A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of online technology and resources.

DISABILITIES STATEMENT

The Americans with Disabilities Act of 1990 and Section 504 of the 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 Americans with Disabilities 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)-951-5708 or email

specialpopulations@lit.edu. You may also visit the online resource at [Special Populations - Lamar Institute of Technology \(lit.edu\)](#).

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. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document.

ARTIFICIAL INTELLIGENCE STATEMENT

Lamar Institute of Technology (LIT) recognizes the recent advances in Artificial Intelligence (AI), such as ChatGPT, have changed the landscape of many career disciplines and will impact many students in and out of the classroom. To prepare students for their selected careers, LIT desires to guide students in the ethical use of these technologies and incorporate AI into classroom instruction and assignments appropriately. Appropriate use of these technologies is at the discretion of the instructor. Students are reminded that all submitted work must be their own original work unless otherwise specified. Students should contact their instructor with any questions as to the acceptable use of AI / ChatGPT in their courses.

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.

ADDITIONAL COURSE POLICIES/INFORMATION