# Course Syllabus

## RC 142 Cardiopulmonary Anatomy and Physiology

<table>
<thead>
<tr>
<th><strong>Class Hours:</strong></th>
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<tr>
<td><strong>Laboratory Hours:</strong></td>
<td>0</td>
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<tr>
<td><strong>Credit Hours:</strong></td>
<td>3</td>
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### Instructor
Mickey Rountree  
Office ext 4770  
Office 2085  
Email mickey.rountree@chattanoogastate.edu

### Course Description
Consists of a study of the structure and function of the respiratory, cardiac and renal systems.

### Entry Level Standards
Current standing in the respiratory care program

### Prerequisites
Acceptance into Respiratory Care Program

### Co Requisites
RC 111

### Textbooks
- Cardiopulmonary A&P, Essentials for Respiratory Care, 5th Ed. by Des Jardins  
  *(Required)*  
- Workbook for Cardiopulmonary A&P, Essentials for Respiratory Care, by Des Jardins

### Class Web Site
RC 142 Elearn

### Library Usage
All students are required to have internet access to check Elearn for course updates and materials. Internet access is available in the RC Lab and the HSC Resource room.

### Internet Access

### Presentation
1. Lecture  
2. Audiovisual aids, including transparencies and power point  
3. Demonstration and student use of equipment  
4. Handouts  
5. Student discussion in classroom

### Specific Evaluation Process

#### Missed Class Tests
- student is responsible for taking all tests as scheduled.  
- Any missed test must be made up as soon as possible, and the make-up test may differ from the original. Acceptable excuses for missing test are jury duty, court subpoena, and illness with a doctor’s excuse. Personal and family emergencies will be reviewed on a case by case basis.

#### Testing sources
- Test material will come from text reading, hand outs and class lectures and activities. The student is responsible for material covered in text but not presented in class.
<table>
<thead>
<tr>
<th>Academic dishonesty</th>
<th>See program policy handbook</th>
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<tbody>
<tr>
<td>Misc</td>
<td>The use calculators during class or testing will be at the instructor=s discretion. Under no conditions will preprogramed calculators be allowed. The TI calculators are ok if not preprogramed before test. The instructor may provide basic calculators for test taking. The use of tape recorders and other recording devises will be at the instructors discretion. No beepers or cellular phone calls during class.</td>
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<tr>
<td>Grade Calculation</td>
<td>Four tests plus a comprehensive final. Each test is 20% of the final grade.</td>
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<tr>
<td>Course Testing, Grading And Retesting</td>
<td>Five tests including the final which is comprehensive. Each test is 20% of final average. Each test must be passed with a minimum grade of 75. Any test below a 75 must be retaken within seven days to achieve a 75 or better. Either the original grade or 70%, whichever is higher will be used to calculate the class average. Only one retest will be given for an exam. Only two tests may be retaken during the semester. A 75 on every test (or retake) is required to pass the course, regardless of overall average. A grade less than 70 on the final exam will result in a grade of D or F; there will be no retest on the final. Students making a score less than 75% on a retest or making less than 75% on a third examination will not be eligible to continue in this class or associated laboratory. Makeup exams will be given without penalty only for excused absence (doctor=s excuse for illness, subpoena, jury duty, court orders). Unexcused makeup test grades will be reduced 5 points per day that the testing center is available until made up. See testing center schedule and note that Saturday is an available day. See your Respiratory Care Handbook for further details regarding retention and testing policies.</td>
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<tr>
<td>Class Attendance :</td>
<td>Punctual attendance at all scheduled classes is expected. Final grade will be reduced 1% for each unexcused absence (acceptable excuses are doctor=s excuse for illness, subpoena, jury duty, court orders) after the second absence. Final grade will be reduced 2% for each tardiness (&gt;5 min) after the second tardiness.</td>
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<tr>
<td>Office Hours</td>
<td>Monday and Friday 10:00-11:00 12:00-3:00</td>
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<td>Disabilities Statement</td>
<td>Students who have educational, psychological, and/or physical disabilities may be eligible for accommodations that provide equal access to educational programs and activities at Chattanooga State. These students should notify the instructor immediately, and should contact Disabilities Support Services within the first two weeks of the semester in order to discuss individual needs. The student must provide documentation of the disability so that reasonable</td>
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accommodations can be requested in a timely manner. All students are expected to fulfill essential course requirements in order to receive a passing grade in a class, with or without reasonable accommodations.

**Disruptive Students:** The term "classroom disruption" means - student behavior that a reasonable person would view as substantially or repeatedly interfering with the activities of a class. A student who persists in disrupting a class will be directed by the faculty member to leave the classroom for the remainder of the class period. The student will be told the reason(s) for such action and given an opportunity to discuss the matter with the faculty member as soon as practical. The faculty member will promptly consult with the division dean and the college judicial officer. If a disruption is serious, and other reasonable measures have failed, the class may be adjourned, and the campus police summoned. Unauthorized use of any electronic device constitutes a disturbance. Also, if a student is concerned about the conduct of another student, he or she should please see the teacher, department head, or division dean.

**Affirmative Action:** Students who feel that he or she has not received equal access to educational programming should contact the college affirmative action officer.

**Changes:** This syllabus can be changed at the discretion of the instructor with written or oral notice.

**Respiratory Care Program Student Learning Outcomes (PSLO)**

PSLO 1) Graduates of the Respiratory Care program will show the ability to interpret, comprehend, apply and evaluate patient data and clinical information relative to their role as an Advanced-Level Respiratory Therapist. CSLO 1-12

PSLO 2). Graduates of the Respiratory Care program will demonstrate the proficiency in all the mechanical and physical skills necessary to fulfill their role as an Advanced-Level Respiratory Therapist.

PSLO 3). Graduates of the Respiratory Care program will demonstrate behaviors and attitudes consistent with professional and employer expectations for an Advanced-Level Respiratory Therapist.

PSLO 4) Graduates of the Respiratory Care program will provide the community with qualified individuals who can meet current and future needs of the workplace as respiratory therapists. CSLO 1-12
Course Student Learning Outcomes

CSLO 1. Know the anatomy of the airways.
CSLO 2. Know the anatomy of the pulmonary circulation.
CSLO 3. Know the mechanics of ventilation.
CSLO 4. Know the mechanisms of oxygen transport.
CSLO 5. Know the mechanism of CO2 transport and acid/base balance.
CSLO 6. Know the structure and function of the heart and circulatory system.
CSLO 7. Know basic values for pulmonary function testing.
CSLO 8. Know basic values for hemodynamic testing.
CSLO 10. Know how aging affects the cardiopulmonary system.
CSLO 11. Know the control of breathing.
CSLO 12. Know the fetal circulation and transitions at birth.

Instructional Indicators:

For CSLO 1:
The RC student will:
1) Know epithelial lining in nose, nasal passages, pharynx, larynx, large and small airways
2) Know what forms the nasal septum
3) Know what prevents aspiration
4) Know what the pores of Kohn and canals of Lambert are
5) Know the location and function of eustachian tubes
6) Know the cartilages of the larynx
7) Know the relationship between resistance and cross sectional area of airways
8) Know where the carina is and the angle of main stem bronchi
9) Know what type I, II, III alveolar cells are, their functions and percentages.
10) Know the action of sympathetic and parasympathetic nervous system and transmitters
11) Know the major and accessory muscles of inspiration
12) Know the accessory muscles of expiration
13) Know the lobes, fissures, segments of each lung
14) Know the innervation of diaphragm
15) Know the difference in cartilaginous vs. non-cartilaginous airways
16) Know the location, function, movement of soft palate

For CSLO 2:
The RC student will:
1) Know the difference between bronchial and pulmonary circulations.
2) Know resistance vs capacitance vessels

For CSLO 3:
The RC student will:

RC 142 Syllabus
1) Know lung/chest wall compliances, definition and values
2) Know airway resistance, definition, units, normal, effects of change in radius on flow or pressure
3) Know intrapleural pressures, normal, variance from apical to bases
4) Know definition of transairway, transpulmonary, transthoracic pressures
5) Know normal respiratory patterns, abnormal patterns and how they vary with changes in resistance and compliance
6) Know normals for $V_t$ and $V_{D(anatomic)}$, formulas for $V_E$ and $V_A$
7) Know the law of LaPlace and its application
8) Know Poiselles law and its application
9) Know the definition of time constants, effects of changes resistance and compliance
10) Know the location, function, anatomy of pleura, ribs, mediastinum, diaphragm
11) Know the definition of surface tension, composition and role of surfactant
12) Be able to calculate the gas law problems
13) Know how to calculate $V_A$ and $V/Q$ and know normals for $V_A$, Q, and $V/Q$.
14) Know how $V/Q$ varies within different lung regions.
15) Know how $P_AO_2$, $P_AC0_2$ and capillary values are affected with increasing and decreasing $V/Q$ ratios.
16) Know how various diseases cause increases or in $V/Q$ and some typical diseases (page 284).
17) Know how exercise affects ventilation.

For CSLO 4:
The RC student will:
1) Be able to work alveolar air equation (remember to only divide PCO2 by .8 on 21% O2)
2) Know % of O2, CO2, N2 in air
3) Know thickness, components of A/C membrane
4) Know transit time and diffusion times at A/C membrane
5) Know how each of the factors in Fick's law affects diffusion
6) Know conditions and diseases that affect diffusion
7) Know difference between perfusion and diffusion limited gases and which O2 is
8) Know how Henry's law affects $P_aO_2$.
9) Know how to calculate how much oxygen is dissolved and bound in blood and how to calculate $C_aO_2$, $C_iO_2$ and $C_vO_2$.
10) Know how to calculate $C_a-vO_2$, oxygen extraction ratio, oxygen delivery, oxygen consumption, and shunt.
11) Know normal values and how $C_a-vO_2$, oxygen extraction ratio, oxygen delivery are affected by changes in cardiac output.
12) Know normal values, and diseases affecting shunt.
13) Know definition of anatomic shunt, shunt effect and causes of each.
14) Know structure and function of Hb, globin chains in adult and fetal Hb. Know what Met Hb is. Know normal Hb values (and units) for males and females.
15) Be able to draw and label an oxyhemoglobin curve and know the 4 things that shift
the curve to the right and the 6 things that shift it left. Know what normal $P_{50}$ is and how it changes as the curve shifts.

16) Know the definitions of hypoxemia and hypoxia and the four different types of hypoxia.
17) Know the definition and cause of cyanosis.
18) Know definitions for polycythemia and erythropoiesis.
19) Know definitions and how $P_AO_2$, $P_ACO_2$ and capillary values are affected with intrapulmonary shunt, Shunt effect, deadspace, deadspace effect.
20) Know definition, how to calculate $R/Q$, and normals for $VO_2$, $VCO_2$, and $R/Q$.

For CSLO 5:
The RC student will:
1) Know definitions for acids, bases and buffers.
2) Know the six ways CO2 is transported.
3) Know the equation for the dissociation of CO2 in water into $H_2CO_3$, $HCO_3^-$ and $H^+$.
4) Know the sequence of chemical reactions when RBC’s release O2 and what the chloride shift is.
5) Know how to calculate the $H_2CO_3$ concentration from $P_aCO_2$.
6) Be able to write the Henderson-Hasselbalch equation and now how changes in the ratio of $HCO_3^-$ to $H_2CO_3$ affect pH.
7) Know how HCO3 changes in metabolic acidosis and alkalosis.
8) Know how $P_aCO_2$ changes in respiratory acidosis and alkalosis.
9) Know how $H_2CO_3$ and $HCO_3^-$ change in mixed alkalosis and acidosis.
10) Know how the body compensates for respiratory and metabolic disorders.

For CSLO 6:
The RC student will:
1) Know definition and normal values (male and female) for Hb and HCT.
2) Know the components of plasma.
3) Know the heart chambers, valves, blood flow, electrical conduction, coronary arteries, cardiac regulation, normal pulse and BP.
4) Know normal pulmonary artery pressures.
5) Know definitions for Zones I, II, III (EX $P_A>P_a>P_v$)
6) Know definitions, formulas and normals for cardiac output and index, stroke volume, stroke volume index, preload, afterload.
7) Know definitions, formulas and normals for CVP, PCWP, PVR, SVR.

For CSLO 7:
The RC student will:
1) Know the 4 volumes and 4 capacities, definitions and normal values and how they change with obstructive and restrictive disease.
2) Know definitions of PEF, $FEF_{200-1200}$, $FEF_{25%-75%}$, normal values and which ones measure large or small airway function.
3) Know what FEV1% is, what it measures, normal values and what diseases decrease it.
4) Know the normal value for RV/TLC and what diseases increase it.
5) Know the normal value for $D_{lCO}$ and what it measures and what diseases might decrease it.
6) Know what a flow volume loop can measure and how the flow volume loop varies with restrictive and obstructive disease.

For CSLO 8:
The RC student will:
1) Know the ports of a pulmonary artery catheter and what values can be directly measured and which can be calculated.
2) Know normal values for cardiac output, cardiac index, stroke volume, stroke volume index, CVP, pulmonary capillary wedge pressure, pulmonary vascular resistance, systemic vascular resistance.
3) Be able to calculate cardiac index, stroke volume, stroke volume index, pulmonary vascular resistance, systemic vascular resistance.

For CSLO 9:
The RC student will:
1) Know the basic structure of the kidney. Know what affects glomerular filtration.
2) Know where and how tubular reabsorption occurs, and what substances are transported by tubular secretion.
3) Know normal urine output, normal specific gravity.
4) Know prerenal, renal and post renal causes of renal failure and examples.
5) Know what effect positive pressure ventilation (PPV) has on renal function. Know where ADH is produced.
6) Know the non-renal effects of renal failure, such as anemia, acid base problems, etc.
7) Know at what pressure edema forms.
8) Know the three ways sodium is reabsorbed, how $\text{HCO}_3^-$ is reabsorbed, and how acid base balance is affected by hypochloremia, hyperchloremia, hypokalemia, hyperkalemia.

For CSLO 10:
The RC student will:
1) Know how aging affects RV, FRC, VC, IRV, peak flows, FEF_{200-1200}, MVV, FEF_{25-75%}, compliance of lung and chest wall, diffusion and at what age they peak.
2) Know how ABG-s are affected by age.
3) Know how cardiac output, stroke volume and BP and max heart rate are affected by age.

For CSLO 11:
The RC student will:
1) Know the two medullary centers, the two pontine centers, the location and role of the central chemoreceptors and peripheral chemoreceptors.
2) Know what stimulates peripheral chemoreceptors, and what effect stimulation has.
3) Know what stimulates central chemoreceptors, and what effect stimulation has.
4) Know how CO2 and HCO₃⁻ move into CSF.
5) Know how the central chemoreceptors and CSF are affected by chronic PₐCO₂ retention, and the implications this has for oxygen therapy.
6) Know how changes in BP affect respiration and cardiac function.
7) Know definitions and effects of juxta-capillary receptors, Hering-Breuer reflex, deflation reflex, irritant reflex,, and how respiration is affected by pain, cold, pharyngeal irritation.

For CSLO 12:
The RC student will:
1) Know landmarks in gestational development of lung - first lung bud, mature A/C units that can support life, surfactant production. Know number of alveoli at birth compared to adult.
2) Know average PO₂ and PCO₂ in umbilical vein and arteries.
3) Know the parts of the placenta and how gas exchange takes place between mother and infant.
4) Know the course of blood flow in the fetal circulation, the three fetal shunts, what causes each of the shunts to close, what each is called after closure.
5) Know average values for newborn resistance, compliance, respiratory rate, heart rate.
6) Know how fluid is cleared from the lung at birth and how much pressure is needed for the first breath.

Required Assessments:

| Test 1 | PSLO1, PSLO 4 | CSLO 1,2, 3, 4 |
| Test 2 | PSLO1, PSLO 4 | CSLO 4, 6, 7, 8 |
| Test 3 | PSLO1, PSLO 4 | CSLO 4, 5 |
| Test 4 | PSLO1, PSLO 4 | CSLO 3, 11 |
| Test 5 (Comprehensive Final) | PSLO1, PSLO 4 | CSLO 9, 10, 12 |

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<td><strong>Anatomy of Respiratory System</strong></td>
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<td><strong>2</strong></td>
<td><strong>Anatomy of Respiratory System</strong></td>
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| **3** | **Anatomy of Respiratory System**  
|       | Ventilation |
| **4** | **Ventilation** |
| **5** | **Diffusion of Pulmonary Gases**  
|       | Test 1 |
| **6** | **PFT Measurements**  
|       | **Circulatory System** |
| **7** | **Circulatory System**  
|       | Hemodynamic measurements |
| **8** | **Test 2 Oxygen Transport** |
| **9** | **Oxygen Transport** |
| **10** | **CO2 Transport** |
| **11** | **Test 3** |
| **12** | **Ventilation/perfusion**  
|       | **Control of Ventilation** |
| **13** | **Control of Ventilation**  
|       | Test 4 |
| **14** | **Fetus and newborn**  
|       | **Aging** |
| **15** | **Renal Failure**  
|       | TEST 5 --FINAL EXAM - COMPREHENSIVE |
Student Acceptance Of Policies

I have read all of the policies contained in the syllabus for Respiratory Care (RC 111) and understand them and agree to abide by them.
Student Signature ________________________________
Date ____________________________
(tear this page out and return this page to the instructor)