MACOMB COMMUNITY COLLEGE
COURSE SYLLABUS

I. **DEPARTMENT/DISCIPLINE**: Health and Human Services - Respiratory Therapy

II. **COURSE TITLE**: Clinical Cardiopulmonary Physiologic Anatomy

III. **CATALOG DESCRIPTION**:

This course is designed to teach the student anatomy and physiology applied to the field of Respiratory Care. Topics covered include: Anatomy and physiology of the Respiratory and Cardiac Systems, Mechanisms of Ventilation, Pulmonary Function Measurements, Gas Diffusion, Oxygen & Carbon Dioxide Equilibration and Transport, Acid Base Regulation, Control of Ventilation and Ventilation/Perfusion Relationships

IV. **PREREQUISITES**: BIO 2710 or 2310
COREQUISITES: RSPT 1060, 1080, 1090

V. **COURSE NUMBER**: RSPT 1050

VI. **CREDIT HOURS**: 4
CONTACT HOURS: 4

VII. **EFFECTIVE TERM**: Fall 2005

VIII. **STUDENT ACADEMIC OUTCOMES: Upon completion of the course, the student will:**

A. Given a model of the upper or lower airway, identify the key structures. (Module A)
   1. Define the directional terms & abdominal quadrants, and regions and be able to use these terms to describe anatomical locations.
   2. Describe the major structures and functions of the upper and lower airways.
   3. Name the lobes and segments of the lungs.
   4. Identify the anatomic landmarks of the thorax.
   5. List the primary and accessory muscles of inspiration and expiration.

B. Given a model of the heart, identify the key structures. (Modules E and F)

   1. List and describe the function of the various components of blood.
   2. Diagram the heart indicating the chambers, blood vessels that enter and leave the heart, cardiac valves, layers of heart muscle, pericardium and blood supply to the myocardial tissues.
   3. Diagram the electrical conduction system of the heart and state the normal rate associated with each intrinsic pacemaker.
   4. Given appropriate data, calculate cardiac output, stroke volume, blood pressure, and vascular resistance and identify if each is out of range.
   5. List the factors that regulate stroke volume.
   6. Explain how the baroreceptors function to affect blood pressure.
   7. Describe the function of a pulmonary artery catheter and state how pulmonary capillary wedge pressure can be used to determine the type of heart failure present.

C. Describe the processes associated with spontaneous ventilation and how gas enters the lungs. (Module B)

1. Diagram the lungs and thorax detailing the lung pressures and pressure gradients.
2. Describe how the movement of the diaphragm affects lung pressures.
3. Discuss the effects of surface tension on lung function.
4. Given appropriate data, define compliance, resistance and calculate each.
5. Define and describe the importance of deadspace ventilation.
6. Given a graph of a ventilatory pattern, identify the ventilation pattern present.

D. Define the process where by gas is moved across the alveolar-capillary membrane. (Module C)

1. List the major gases present in the atmosphere and demonstrate how to determine the partial pressure of each gas and the total gas present.
2. Given the appropriate information, calculate the PAO_2.
3. Diagram the pathway of gas diffusion across the alveolar capillary (A-C) membrane and describe how each can affect gas diffusion.
4. Explain how the $D_{L_{CO}}$ test is performed to determine diffusion defects in the lung.

E. Identify and contrast the parameters used in assessing pulmonary function. (Module D)

1. List and describe the technique for determining the volumes and capacities of the lung and state their normal values.
2. Using graph paper, diagram and calculate the key volumes and flowrates associated with a pulmonary function study.
3. Given pulmonary function data, identify the process as obstructive, restrictive, mixed, or normal.

F. Describe the process by which oxygen gets from the alveolus to the tissues of the body. (Module G)

1. Differentiate between hypoxia and hypoxemia and state how each are determined.
2. List the indices that are used to assess oxygenation and describe how each affect the total amount of oxygen carried in the blood.
3. Given appropriate known values, calculate the oxygen content, oxygen content difference, and oxygen delivery.
4. List the factors that shift the oxyhemoglobin curve to the right and to the left.
5. State the causes of hypoxemia and how each is treated.
6. List the types of hypoxia and give an example of each.

G. Describe the process by which carbon dioxide is removed from the body. (Module H)

1. List the three ways CO_2 is transported in the plasma and the three ways it is transported in the RBC.
2. Given the appropriate data, calculate the carbon dioxide content and state the normal values for each parameter.
3. Describe the relationship between $PaCO_2$, H ions, and pH.
4. Describe the ratio of HCO_3^- ions to H_2CO_3 ($PaCO_2$).
5. Given appropriate acid-base data, describe the acid-base status including level of compensation, oxygenation status, and state a possible cause of for the disorder.
6. Differentiate between acute and chronic respiratory/ventilatory failure and identify acid-base disturbances that requires mechanical ventilation.
7. Given an ABG, identify an acute exacerbation of COPD.

H. Describe the relationship between ventilation and perfusion and identify when the cause of any abnormality in this relationship. (Module I)

1. Explain how the $\dot{V}/\dot{Q}$ ratio is derived and state the normal value.
2. Given appropriate data, identify the types of $\dot{V}/\dot{Q}$ ratios and state a condition associated with this ratio.
3. Given appropriate data, calculate the $\dot{V}/\dot{Q}$ and deadspace fraction.
4. List the types of deadspace and state how each are calculated.

I. Describe the process by which ventilation is regulated. (Module J)

1. Describe the function of the respiratory centers in the medulla oblongata, apneustic and pneumotaxic centers.
2. Describe the function of the central and peripheral chemoreceptors.
3. List and describe the various reflexes associated with ventilation.

IX. COURSE ASSESSMENT

A. Comprehensive final exam.
B. Course Evaluation completed at the end of the semester.
C. Early Warning Rosters & faculty evaluations completed at mid-term.

X. COURSE CONTENT OUTLINE

A. Anatomy Review
   1. Directional Terms
   2. Planes of the Body
B. Anatomy of the Respiratory System
   1. Tissue Epithelium
   2. Upper Airway
   3. Lower Airway
   4. Site of Gas Exchange
   5. Pulmonary Vascular System

6. Neural Control
7. Lungs
8. Mediastinum
9. Thorax
10. Muscles of Ventilation

C. Ventilation
1. Pressure Differences
2. Mechanics of Ventilation
3. Static Characteristics of the Lung
   a. Elastic
   b. Surface Tension
4. Dynamic Characteristics of the Lung
5. Ventilatory Patterns

D. Diffusion
1. Dalton’s Law
2. Alveolar-Capillary structure
3. Alveolar Gas Equation
4. Gas Diffusion across the A-C membrane

E. Pulmonary Function
1. Lung Volumes
2. Lung Capacities
3. Pulmonary Function Studies

F. Circulatory System
1. Blood Composition
2. Heart Anatomy
3. Systemic and Pulmonary Vascular Resistance
4. Conduction System
5. Electrocardiography
6. Blood Pressure
7. Heart Failure
8. Baroreceptors
9. Blood Volume

G. Oxygen Transport
1. Oxygen Transport
2. Oxygen Dissociation Curve
3. Tissue Hypoxia
4. Cyanosis
5. Polycythemia
6. Pulse Oximetry

H. Carbon Dioxide Transport
1. Carbon Dioxide Transport
2. Carbon Dioxide Elimination
3. Carbon Dioxide Dissociation Curve
4. Acid-Base Balance
5. Base Excess/Deficit

I. Ventilation Perfusion Relationships

J. Control of Breathing