Broward Community College
Course Outline

STATUS: A

COMMON COURSE NUMBER: RET 1484

COURSE TITLE: CARDIOPULMONARY PATHOPHYSIOLOGY

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN:

lecture/Discussion: 48

Laboratory: 0

Other: 0

CONTACT HOURS/WEEK: 3

CATALOG COURSE DESCRIPTION:

This course is designed to introduce the students to the basic concepts of cardiopulmonary disease. Included are the mechanism of altered lung structure, airway caliber, neurogenic control and pulmonary vascular function.

Prerequisite: RET 1026 , RET 1026 L , RET 1485
Co requisite: RET 1264 , RET 1264 L , RET 1832 L, CPT 1200

General Education Requirements - Associate of Arts Degree, meets Area(s): none
General Education Requirements - Associate in Science Degree, meets Area(s): none

UNIT TITLES:

1. Review of normal cardiopulmonary anatomy and physiology
2. Mechanisms of altered pulmonary function
3. Obstructive pulmonary disorders
4. Restrictive pulmonary disorders
5. Neuromuscular disorders
6. Pulmonary infections
7. Cardiac and pulmonary vascular disorders

I. Course Overview:

Upon successful completion of this course, the students should be able to:

II. Units:

UNIT 1.	REVIEW OF NORMAL CARDIOPULMONARY ANATOMY AND PHYSIOLOGY
General outcomes	The student will describe the anatomy of the lungs and airways and the physiologic mechanisms which maintain pulmonary and blood gas homeostasis.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
1.1	Identify the location and function of: intercostal muscles — diaphragm submucosal glands — goblet cells cilia — mucus lung segments — lobes large airways — small airways cartilage — smooth muscle nose — pharynx larynx — alveoli hilum — carina visceral pleura — parietal pleura
1.2	Differentiate between dead space and alveolar ventilation.
1.3	differentiate between anatomic and alveolar dead space.
1.4	List the lung volumes and the lung capacities
1.5	List the normal values for lung compliance and airway resistance and the formulas used to calculate them.
1.6	Calculate lung compliance when given pressure and volume changes.
1.7	Calculate airway resistance when given flowrate and pressure gradient.
1.8	Describe the physiologic mechanisms whereby the pontine and medullary centers maintain normal ventilation.
1.9	List the normal values for: $Pa0_2$ $P\bar{v}0_2$ P_A0_2 $\dot{V}C0_2$ pH $Sa0_2$ $S\bar{v}0_2$ $P(A\text{-}a)0_2$ $\dot{V}0_2$ $PaC0_2$ $Ca0_2$ $C\bar{v}0_2$ $C(a\text{-}\bar{v})0_2$ $\dot{V}_A/\dot{Q}_C$
1.10	Calculate cardiac output and shunt fraction using the information listed above.
1.11	Use the alveolar air equation to calculate P_A0_2.
1.12	Calculate oxygen content when given hemoglobin content, $P0_2$ and saturation.
1.13	Given any two of the following, $\dot{Q}$, $\dot{V}0_2$, $C(a\text{-}\bar{v})0_2$, calculate the third.
	Draw the oxyhemoglobin dissociation curve and indicate the partial pressures

1.14	which correspond to saturations of: 50%, 75%, 90%, 95%.
1.15	Define acids, bases and buffers.
1.16	Write the Henderson-Hasselbalch equation and use it to calculate pH when given HCO_3:$C0_2$ ratios.

UNIT 2.	MECHANISMS OF ABNORMAL CARDIOPULMONARY FUNCTION
General outcomes	The student will describe how altered lung structure and airway caliber occur in humans and how the changes affect ventilatory function.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
2.1	Describe how hypoventilation, $\dot{V}_A/\dot{Q}_C$ mismatch and shunts affect blood oxygenation and $P(A\text{-}a)0_2$.
2.2	Describe the pulmonary function changes which would indicate the presence of obstructive or restrictive pulmonary disorders.
2.3	Describe the anion gap and identify the primary electrolyte changes associated with metabolic abnormalities.
2.4	When given abnormal blood gas values, classify the abnormality, list the probable causes and describe appropriate corrective measures.
2.5	Describe inspection, palpation, percussion and auscultation as they relate to the pulmonary examination.
2.6	Describe normal breath sounds for each area of the chest.
2.7	Describe rales, rhonchi, wheezes and pleural friction rubs and identify the diseases with which they are usually associated.
2.8	Describe the appearance of air, fluid, or consolidated tissue on X ray film,
2.9	Identify the major pulmonary, cardiac and thoracic landmarks on X ray.

UNIT 3.	OBSTRUCTIVE PULMONARY DISORDERS
General outcomes	The student will list the most common obstructive pulmonary diseases and describe the diagnostic procedures, treatment, pathophysiology and the etiology for each.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
3.1	Describe the etiology, pathophysiology, signs, symptoms, diagnostic procedures and treatment for each of the following: emphysema chronic bronchitis cystic fibrosis bronchial asthma bronchiectasis bronchogenic carcinoma
3.2	Describe the role of inflammation, spasm, secretions and airway collapse in obstructive disorders.
3.3	Describe the Reid index
3.4	Describe the ausculatory and X-ray findings usually associated with pulmonary hyperinflation and infiltrates.
3.5	Describe how alpha-1, antitrypsin deficiency influences pulmonary anatomy, physiology and function.
3.6	Describe the morbidity and mortality rates for lung cancer in the United States.
3.7	Describe the different types of cancer cells. For each one indicate the rates of occurrence and mortality and the area of the lung each is predisposed to affect.
3.8	List the primary forms of therapy for lung cancer and indicate the success rates for each.
3.9	Describe the signs, symptoms and methods used to diagnose lung cancer.
3.10	Differentiate between the characteristics of the "Pink Puffer" and the "Blue Bloater".

UNIT 4.	RESTRICTIVE PULMONARY DISORDERS
General outcomes	The student will list the most common restrictive pulmonary diseases and describe the diagnostic procedures, treatment, pathophysiology and the etiology for each.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
4.1	Describe the etiology, pathophysiology, signs, symptoms diagnostic procedures and treatment for each of the following: Atelectasis Pneumothorax Pneumoconiosis ARDS Hyaline membrane disease
4.2	Describe the ausculatory and X-ray findings associated with edema, infiltrates, lung or alveolar collapse and tissue consolidation.
4.3	Describe the advantages and disadvantages of PEEP and increased $Fi0_2$ in treating intractable hypoxemia.
4.4	Describe the methods used to administer PEEP and oxygen to patients with ARDS and the techniques used to evaluate their effectiveness.
4.5	Describe the most common forms of multisystem failure encountered with patients suffering from ARDS.
4.6	Describe the role of surfactant in maintaining alveolar stability.
4.7	Describe the pulmonary function findings which would indicate the presence of restrictive pulmonary disease and decreased diffusing capacity.
4.8	List the primary factors which predispose to hyaline membrane disease.
4.9	Describe the APGAR evaluation system
4.10	List the occupations which are most commonly associated with the development of pneumoconiosis.

UNIT 5.	NEUROMUSCULAR DISORDERS
General outcomes	The student will list the most common neuromuscular diseases and describe the diagnostic procedures, pathophysiology, treatment and etiology for each.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
5.1	Describe the monitoring system which is used to evaluate respiratory adequacy in patients with neuromuscular disorders.
5.2	Describe the findings that would indicate that ventilatory support is necessary in patients with neuromuscular disorders.
5.3	Describe the neural pathways for impulses from the brain to the respiratory muscles.
5.4	Describe the role of acetylcholine and cholinesterase in the transmission of nervous impulses across the neuromuscular juncture.
5.5	Describe the autoimmune mechanism which may be responsible for Myasthenia gravis.
5.6	List the drugs which are used to treat myasthenia gravis. Indicate which of the drugs is used to determine the presence of a myasthenic crisis.
5.7	Describe the pathologic changes which are noted with Guillain-Barr'e Syndrome.
5.8	Describe the physical characteristics which are most common for patients with Pickwickian Syndrome.
5.9	Define primary alveolar hypoventilation

UNIT 6.	PULMONARY INFECTIONS
General outcomes	The student will list the most common infectious pulmonary diseases and describe the diagnostic procedures, treatment, pathophysiology and etiology for each.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
6.1	Describe the current morbidity and mortality statistics for AIDS in the United States.
6.2	Define AIDS, HIV and CMV
6.3	Describe the opportunistic organisms which most commonly infect victims of AIDS.
6.4	Describe the process by which AIDS undermines the body's immune system.
6.5	List the drugs which are most effective in the treatment of AIDS and indicate the mechanism of action and adverse side effects of each.
6.6	Describe the precautions which must be taken to prevent AIDS contamination.
6.7	Describe the technique used to determine whether an organism is gram positive or gram negative.
6.8	List the most common gram positive and gram negative bacterial pneumonias, describe the pathophysiology and indicate the best forms of treatment for each.
6.9	List the host characteristics which predispose to the development of pneumonia.
6.10	Describe the symptoms and signs commonly associated with tuberculosis and indicate the reasons for the recent increase in the incidence of the disease.
6.11	Describe the advantages and disadvantages of AFB, X-rays and the PPD test in diagnosing tuberculosis.
6.12	List the host characteristics which predispose to the development of tuberculosis
6.13	List the drug regimen which is usually followed in the treatment of tuberculosis.

UNIT 7.	CARDIAC AND PULMONARY VASCULAR DISORDERS
General outcomes	The student will list the most common cardiac and pulmonary vascular disorders and describe the diagnostic procedures, treatment, pathophysiology and etiology for each.
	SPECIFIC LEARNING OUTCOMES To successfully complete this unit the student will:
7.1	List the normal values for each of the following: pulmonary artery systolic, diastolic and mean pressures pulmonary capillary wedge pressure LVEDP ejection fraction stroke volume
7.2	List the normal values for pulmonary capillary hydrostatic pressure and colloid osmotic pressure
7.3	Describe how colloid osmotic pressure, hydrostatic pressure, alveolar capillary membrane permeability and the lymphatic system affect pulmonary vascular fluid movement
7.4	Differentiate between cardiogenic and non cardiogenic pulmonary edema.
7.5	Describe the clinical effects of excessive amounts of extravascular lung water.
7.6	Define preload and afterload
7.7	Define forward failure and backward failure
7.8	Define cor pulmonale.
7.9	Define and describe congestive heart failure
7.10	List the primary causes of left ventricular failure.
7.11	Describe how left ventricular failure affects the pulmonary vascular system.