Course Information Form (CIF)

Course Code: RTT 131

Course Title: Respiratory Science

Department: Allied Health
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 40.0101
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 3-0-3
Credit Hour Distribution:

Lecture: 3	Lab: 0	Clinical: 0	**Total: 3**

General Course Information

Catalog Description

Application of respiratory science including respiratory research, infection control, metric conversions, atmospheric gasses, gas behaviors, gas laws, fluidics, gas assessment, humidity, and changes of state.

General Course Objectives

Upon completion of the course the student will be able to: Demonstrate understanding and application of basic science principles governing gas flow and behavior, temperature, and humidity. Identify the key components of infection control and apply them to clinical practice in the health professions.

Minimum Placement Levels

English	Reading	Math
Placement out of ENG 099	Placement out of CCS 099	Placement out of MAT 072

Prerequisites

Concurrent enrollment in RTT 130 and RTT 132
Credit or concurrent enrollment in RTT 117 and BIO 121
Admission into the Respiratory Care program

Methods of Evaluation

1 final exam, 3-5 objective exams, 2-4 in class quizzes, 8-10 weekly quizzes, and 13-15 weekly home work assignments.

Instructional Materials and Additional Supplies

Egan's Fundamentals of Respiratory Care, current edition, Kacmarek, R.M., Stoller, J.K., Heuer, A.J.; Elsevier.; ISBN: 9780323931991
Please note students may choose print or online instructional material.

Course Content

General Learning Outcomes (GLOs)

- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Respiratory Care Research	1. Explain and discuss the importance of research activities in health care. 2. Identify, describe, and explain the components of a research study. 3. Identify and describe several sources of information that are commonly used during a literature search. 4. Identify, describe, and explain the various components of a scientific paper. 5. Describe the three basic formats for publishing a research study. 6. Identify, interpret, and discuss research terminology and concepts as they apply to the field of respiratory care.	2	0	0
Microbiology	1. Identify, describe, and discuss the morphologies of bacteria. 2. Describe and discuss the bacterial staining procedure to identify the bacterial type. 3. Identify and discuss common bacteria associated with pulmonary infections. 4. Describe and discuss bacterial growth including a) bacterial reproduction, b) growth stages, c) bacterial mats and biofilms. 5. Describe and discuss the immune response to bacterial invasion. 6. Identify and describe various upper and lower respiratory tract infections. 7. Describe and discuss normal flora including a) differentiate normal flora from pathogens; b) identify areas of normal occurring flora in the human body. 8. Describe and discuss the characteristics and roles of fungi, viruses, prions, and parasites in diseases. 9. Identify, describe, and discuss the important aspects of pulmonary infections classifications. 10. Describe several different sampling methods for collection of bacteria for analysis. 11. Describe and discuss the sputum culture and sensitivity procedure for the identification of pulmonary Infection. 12. Describe and discuss the chemotherapeutic agents used for pulmonary infections. 13. Identify, describe, and discuss the concept of bundling care based on specific patient conditions.	3	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Infection Control	1. Define and discuss health care associated infections, differentiating between community- and hospital-acquired. 2. Describe and discuss the prevalence and implications of health care associated infections. 3. Identify, describe, and discuss three elements that must be present for transmission of infection within a health care setting. 4. Identify, describe, and discuss infection prevention strategies utilized in the health care setting. 5. Describe and discuss the importance of handwashing to prevent the spread of infection. 6. Describe and discuss standard-based precautions including a) gloves, b) gowns, c) goggles, d) masks, e) face shields. 7. Describe and discuss transmission-based precautions including a) direct and indirect contact, b) droplet, c) airborne. 8. Identify, describe, and discuss the risk infection categories of equipment processing including a) critical, b) semi-critical, c) non-critical. 9. Identify, discuss, and describe methods of equipment cleaning including a) cleaning, b) disinfection, c) sterilization. 10. Identify, describe, and discuss equipment cleaning processes including both physical and chemical methods. 11. Identify and explain the proper methods for processing and maintenance of respiratory equipment including a) large and small volume nebulizers, b) ventilator circuits, c) oxygen delivery devices, d) bag mask devices, e) suction systems, f) PFT equipment. 12. Describe and discuss equipment use and handling procedures including a) reusable vs disposable equipment, b) handling fluids and medications, c) contaminated equipment, d) handling laboratory specimens. 13. Describe and discuss surveillance and treatment programs aimed to reduce the number of health care infections. 14. Describe and explain appropriate procedures for preventing the transmission of infections for given patient case studies.	3	0	0
Measurement Conversions	1. Compute measurements in both English and metric systems as they apply to specific situations and patient case studies including a) temperature, b) mass, c) volume, d) length, e) time, f) pressure. 2. Identify, determine, and label the correct units of measure for all calculations including a) Temperature - degrees Celsius (C), degrees Fahrenheit (F), Kelvin (K); b) Mass - pounds (lbs), kilograms (Kg), grams (g); c) Volume - liters (L), millimeters (mL); d) Pressure - millimeters of mercury (mmHg), centimeters of water pressure (cmH20), Torr.	2	0	0
Atmospheric Gas Measurement	1. Identify, describe, and discuss the layers of the Earth's atmosphere. 2. Identify, describe, and discuss the gasses that make up the atmosphere and their individual concentrations. 3. Discuss oxygen and carbon dioxide's roles in supporting life on Earth. 4. Identify, explain, and discuss the measurement of atmospheric pressure. 5. Identify and compute measurements that relate to the atmosphere. 6. Discuss the role of water vapor in a gas or a mixture of gasses. 7. Identify and discuss the calculation to correct for the presence of water vapor in a sample of air. 8. Identify and discuss common conditions affecting gas volumes. 9. Identify, discuss, and compute atmospheric gas measurements based on patient case scenarios.	2	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Gas Behaviors	1. Identify, explain, and discuss molecular states of matter including a) solids, b) liquid, c) gasses. 2. Explain and discuss the Kinetic Molecular Gas Theory. 3. Identify, explain, and discuss the measurements of atmospheric pressures. 4. Explain and discuss how pressure, temperature, and humidity affect gas volumes. 5. Identify and discuss key terminology that is used in relation to atmospheric pressures. 6. Identify the gasses and their concentrations that comprise the barometric pressure. 7. Identify, discuss, and compute Dalton's Law of partial pressures including measurements for a) a single gas, b) a gas mixture. 8. Identify and discuss how changes in atmosphere affect the pressure of inspired oxygen (PIO2). 9. Identify, discuss, and compute the PIO2 in patient situations including a) hypobaric conditions, b) hyperbaric conditions. 10. Identify, discuss, and compute gas density using the formula for Avogadro's Law to solve for the weight density of a gas including a) single gas, b) multiple gas mixture. 11. Discuss relationships and compute formula conversions between various pressures/units of measure including inHg to mmHg, cmH20 to mmHg, and Torr to mmHg. 12. Identify the formula and compute calculations to determine the PIO2 in specific patient case situations and case studies. 13. Explain, discuss, and compute the density of commonly used respiratory care gasses using Avogadro's Law. 14. Discuss gas behaviors based on specific patient case scenarios.	3	0	0
Gas Laws	1. Identify, discuss, and explain Fick's Law of Diffusion and the factors that affect gas flow through a membrane. 2. Identify, discuss, and explain the solubility coefficient using Henry's Law. 3. Discuss the relationship of Henry and Graham's Laws and how they determine the amount of gas dissolved in a liquid. 4. Discuss the relationship of oxygen and carbon dioxide using Henry and Graham's Laws. 5. Identify and discuss the ideal gas law including the constant and variable relationships for Boyle's, Charles' and Gay Lussac's gas laws. 6. Identify, discuss, and compute the use of the combined gas law to determine the relationships between pressure, temperatures, and volumes of gasses. 7. Identify, discuss, and compute water vapor pressure at BTPS. 8. Identify, discuss, and compute the correction of water vapor pressure in a gas mixture. 9. Identify, discuss, and compute gas laws based on patient case scenarios.	6	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Humidity and Changes of State	1. Identify, explain, and discuss the law of thermodynamics applying the theory of heat transfer including a) convection, b) conduction, c) radiation, d) evaporation, f) condensation. 2. Explain and discuss the effects that surface area, temperature, and air movement have on evaporation. 3. Explain and discuss the effects of condensation and rain-out. 4. Explain and discuss the concept of absolute zero. 5. Explain and discuss the key characteristics of the changes of states of matter including a) melting, b) freezing. 6. Explain and discuss the various properties of liquids including a) flow, b) pressures, c) buoyancy, d) surface tension, e) viscosity, f) capillary action. 7. Discuss various vapor phases including evaporation, boiling point, and state of equilibrium. 8. Discuss and explain terminology related to humidity. 9. Identify, explain, and discuss the normal temperature and humidity of gas at various points along the respiratory tract. 10. Identify, discuss, and compute humidity values including a) absolute humidity, b) humidity deficit, c) percentage of body humidity (%BH). 11. Explain and discuss how critical temperature, critical pressure, and the critical point apply to gasses and liquid gasses. 12. Identify, discuss, and compute calculations and concepts of humidity, the law of thermodynamics, changes of state, properties of liquids, and liquid-vapor phase changes to patient case scenarios.	8	0	0
Fluidics	1. Identify, explain, and discuss the principles and laws of fluid dynamics to various fluid conducting systems. 2. Explain and discuss the law of continuity in relationship to ventilatory and circulatory physiology. 3. Explain and discuss Bernoulli's Principle to air entrainment devices and to partially obstructed airways receiving ventilation. 4. Discuss the rationale for helium-oxygen therapy in respiratory care. 5. Discuss, explain, and demonstrate how to perform and analyze air entrainment calculations including a) O2/Air ratio, b) total flow of device. 6. Discuss and explain the concept of the Coanda Effect in relationship to a) fluidic devices, b) distribution of gas flow in the lungs. 7. Discuss and explain the different types of flow patterns found in the tracheobronchial tree including a) laminar, b) transitional, c) turbulent. 8. Identify, explain, and discuss the concept of the Reynolds number to fluid flow pattern. 9. Identify, explain, and discuss Poiseuille's Law and formula of laminar flow in clinical situations. 10. Explain and discuss Ohm's Law and equation of resistance to clinical situations. 11. Identify and discuss the various components that account for resistance to ventilation including a) elastic resistance, b) non-elastic resistance, c) airway resistance. 12. Explain and discuss the principles of fluid viscosity. 13. Explain and discuss concepts of fluid dynamics to the pulmonary and circulatory systems in specific patient case scenarios.	8	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Gas Assessment	1. Identify, describe, and discuss the indications and operation principles of different types of electrochemical oxygen analyzers including a) Polargraphic, b) Galvanic. 2. Describe and discuss clinical errors, problem solving, and troubleshooting techniques for oxygen analyzers. 3. Describe, discuss, and explain the indications and operational principles of oximetry including a) pulse oximetry, b) hemoximetry, c) venous oximetry, d) tissue oximetry. 4. Explain and discuss how oximetry estimates oxygen saturation. 5. Describe, explain, and discuss the limitations, problem solving, and troubleshooting techniques of oximetry. 6. Explain how the pulse oximeter plethysmographic waveform can be used to assess peripheral perfusion. 7. Describe and discuss the indications, operational principles, and instrumentation of respiratory gas assessment including a) blood gasses, b) hemoximetry. 8. Identify and discuss the analytes measured in blood gas sampling. 9. List and discuss quality control assurance procedures for blood gas analyzers. 10. Discuss advantages of point of care testing for blood gas analysis. 11. Describe, explain, and discuss the indications, operational principles, instrumentation, and interpretation of transcutaneous oxygen and carbon dioxide monitoring. 12. Describe and discuss limitations, clinical errors, problem solving, and troubleshooting techniques of transcutaneous monitoring. 13. Describe, discuss, and explain the indications, operational principles, and instrumentation of capnography and capnometry including a) semi-quantitative, b) quantitative, c) wave form capnometry; i) mainstream, ii) sidestream. 14. Describe, discuss, and interpret the capnogram given specific patient situation and cases including a) normal capnogram, b) abnormal capnogram. 15. Describe, explain, and discuss the limitations, problem solving, and troubleshooting techniques of capnography. 16. Discuss the physiologic considerations between end-tidal carbon dioxide (EtCO2) and arterial partial pressure of carbon dioxide (PaCO2). 17. Explain, discuss, and differentiate various gas measurements based on specific patient case studies.	8	0	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	0	0