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Office: Department of Clinical Studies Rm 2121; Rm 2104

**COURSE CONTENT:**
1. Weekly reading group for residents (Guyton & CVT), day/time to be confirmed by residents
2. Weekly class meeting time, see schedule
3. Weekly journal club, **with students’ own specialty service**
4. Clinical activities related to class topics

**COURSE OBJECTIVES:**
The objectives of the course are to review the physiology & pathophysiology of the respiratory system. The approach will be with a clinical emphasis focused on understanding the pathophysiology of respiratory disease & its management. A third of the course will be dedicated to mechanical ventilation.

**FORMAT:**
1 hour seminars led by OVC Faculty and enrolled students, with interactive discussion. Active participation of registrants will be expected (readings completed prior to lecture). Room 2152 from 8:30 to 9:30am.

<table>
<thead>
<tr>
<th>Date 8:30-9:30</th>
<th>Room</th>
<th>Topic</th>
<th>Class</th>
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<tbody>
<tr>
<td>Thursday January 11</td>
<td>2152</td>
<td>Functional Anatomy of The Lungs, Lung Volumes</td>
<td>Bersenas</td>
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<td>Thursday January 18</td>
<td>2152</td>
<td>Pulmonary Circulation &amp; Gas Transport</td>
<td>Bersenas</td>
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<td>Thursday January 25</td>
<td>2152</td>
<td>Gas Exchange - Diffusion / Ventilation Perfusion Relationships</td>
<td>Resident</td>
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<td>Thursday February 1st</td>
<td>2152</td>
<td>Imaging Of The Airways</td>
<td>Mackenzie</td>
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<td>Thursday Feb 8</td>
<td>2152</td>
<td>Mechanics of Breathing &amp; Regulation of Ventilation</td>
<td>Holowaychuk</td>
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<td>Date</td>
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<td>6</td>
<td>Thursday Feb 15</td>
<td>2152</td>
<td>Airway Sampling</td>
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<td>7</td>
<td>Thursday Feb 22</td>
<td>2152</td>
<td>Respiratory Insufficiency / Failure / ARDS</td>
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<td>8</td>
<td>Thursday March 1st</td>
<td>2152</td>
<td>Pulmonary Edema – Cardiogenic &amp; Non-Cardiogenic</td>
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<td>9</td>
<td>Monday March 5th</td>
<td>2152</td>
<td>Tracheal collapse</td>
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<td>10</td>
<td>Thursday March 15</td>
<td>2152</td>
<td>Respiratory system defense mechanisms and Bronchopneumonia</td>
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<tr>
<td>11a</td>
<td>Tuesday March 20</td>
<td>2152</td>
<td>Positive Pressure Ventilation</td>
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<tr>
<td>11b</td>
<td>Thursday March 22</td>
<td>2152</td>
<td>Pulmonary Thromboembolism</td>
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<tr>
<td>12a</td>
<td>Tuesday March 27</td>
<td>2152</td>
<td>MV – Optimizing Ventilation, Lung Protective Strategies, Permissive Hypercapnia</td>
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<tr>
<td>12b</td>
<td>Thursday March 29</td>
<td>2152</td>
<td>Asthma And Bronchitis In Cats</td>
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<tr>
<td>13a</td>
<td>Tuesday April 3rd</td>
<td>2152</td>
<td>Bronchitis In Dogs</td>
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<tr>
<td>13b</td>
<td>Thursday April 5</td>
<td>2152</td>
<td>Monitoring – Pulse Oximetry, Capnography, Blood Gas Analysis, &amp; Co-Oximetry</td>
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<tr>
<td>14a</td>
<td>Tuesday April 10</td>
<td>2152</td>
<td>MV – patient asynchrony &amp; interpretation of loops and waveforms</td>
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<tr>
<td>14b</td>
<td>Thursday April 12</td>
<td>2152</td>
<td>What Is New In The Nose In Small Animals?</td>
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<tr>
<td>15a</td>
<td>Tuesday April 17</td>
<td>2152</td>
<td>Weaning from the Ventilator</td>
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<td>15b</td>
<td>Thursday April 19</td>
<td>2152</td>
<td>Oxygen Toxicity</td>
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<td>Final Exam (Exam Period)</td>
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METHOD OF EVALUATION (INCLUDE BREAKDOWN OF MARKS):

Students will be evaluated as follows:

- Lecture presentation – Students will select one of the lectures to present during the semester. They will be expected to present a 45 min -1 hour lecture to the class summarizing the readings. A power point presentation is mandatory for this presentation. (30%)

- Exam question development – Students will be expected to develop and provide 3 examples of multiple choice or short answer questions from their lecture topic. These may be used in subsequent years. (10%)

- Student participation based on contributions to group discussions and evaluation of seminars by student peers (10%).

- A final examination (50%) will take place during the exam period on a date to be announced. An essay style written examination will cover topics delivered throughout the semester. Guest lecturers can alternatively provide multiple choice or short answer questions.
LECTURE OUTLINE
(READINGS PROVIDED IN COURSELINK):

Lecture 1
FUNCTIONAL ANATOMY OF THE LUNGS, LUNG VOLUMES
West Physiology
- Chapter 1 – Structure & Function
- Chapter 2 – Ventilation
- Chapter 7 – Mechanics of Breathing
Guyton Chapter 37 – Pulmonary Ventilation

Lecture 2
PULMONARY CIRCULATION & GAS TRANSPORT
West Physiology
- Chapter 4 - Blood Flow and Metabolism
- Chapter 6 – Gas transport by the blood
Guyton Chapter 38 Pulmonary Circulation pg 477-481 ONLY
Guyton Chapter 40 Transport of O₂ and CO₂ in Blood and Tissues pg 163-173

Lecture 3
GAS EXCHANGE - DIFFUSION / VENTILATION PERFUSION RELATIONSHIPS
West physiology
- Chapter 3 – Diffusion
- Chapter 5 – Ventilation – perfusion relationships
Guyton Chapter 39 – Physical Principles of Gas Exchange; Diffusion of O₂ & CO₂

Lecture 4
IMAGING OF THE AIRWAYS

Thrall. Textbook of Veterinary Diagnostic Radiology.
Chapter 25: Interpretation paradigms for the small animal thorax
Chapter 34 (5th edition) or 33 (6th edition): The canine and feline lung


Lecture 5
MECHANICS OF BREATHING AND REGULATION OF VENTILATION
West Physiology
- Chapter 7 – Mechanics of Breathing
- Chapter 8 – Control of Ventilation
Guyton Chapter 41 – Regulation of Respiration

TO READ ON YOUR OWN – FYI
VENTILATION AND PULMONARY FUNCTION TESTING (Difficult to apply to Vet Med)
West Respiratory Physiology
- Chapter 10 – Tests of pulmonary function
West Pulmonary Pathophysiology
- Chapter 1 – Ventilation
Veterinary Clinics of North America, Small Animal Practice
- Respiratory Physiology, Diagnostics and Disease September 2007
  o Airway Physiology and Clinical Function Testing

Lecture 6
AIRWAY SAMPLING

Textbook of Small Animal Internal Medicine- 8th edition, Ettinger SJ.
Chapter 240: Clinical Evaluation of the Respiratory Tract
JVECC 2011; 21(5):515-520: use of deep oral swabs as surrogate for transoral tracheal wash

Supplemental readings:

Lecture 7
RESPIRATORY INSUFFICIENCY / FAILURE / ARDS
West Pulmonary Pathophysiology
- Chapter 2 – Gas Exchange
Guyton Chapter 42 Respiratory Insufficiency
L. King. Textbook of Respiratory Diseases in Cats & Dogs (Saunders) pg 53-60
Journal Articles ACVECC ARDS Consensus Statements
  • DeClue AE, Cohn LA. ARDS in cats and dogs JVECC 2007 14(4) 340-347
  • Balakrishnan Retrospective evaluation of the prevalence, risk factors, management, outcome and necropsy findings of ALI and ARDS in dogs and cats: 29 cases. JVECC 2017
  • Acute Respiratory Distress Syndrome the Berlin Definition JAMA 2012
  • Acute Respiratory Distress Syndrome Lancet 2016

Lecture 8
PULMONARY EDEMA – CARDIOGENIC & NON-CARDIOGENIC
To be determined. See Courselink
PREVIOUS READINGS:
Guyton Chapter 38 - Pgs 481-484, pulmonary edema and pleural fluid
West Pulm Pathophysiology Chapt 6 Vascular Diseases (Pulmonary Edema pg 95-
104)
Rose BD, Post TW. Clinical Physiology of Acid Base and Electrolyte Disorders–
Chapter 16 - Edematous States select pages dealing with pulmonary edema fluid
King L. Textbook of Respiratory Diseases in Cats & Dogs (Saunders) pg 487-495

Lecture 9
TRACHEAL COLLAPSE
Textbook of Small Animal Internal Medicine- 8th edition, Ettinger SJ.
Chapter 241: Diseases of the Trachea and Small Airways

Lecture 10
RESPIRATORY SYSTEM DEFENSE MECHANISMS AND BRONCHOPNEUMONIA
Textbook of Small Animal Internal Medicine- 8th edition, Ettinger SJ.
Chapter 242: Disease of the Pulmonary Parenchyma
Pathologic Basis of Veterinary Disease, 4th ed. Chapter 9: Respiratory system
(limited to p463-473)

Lecture 11a
POSITIVE PRESSURE VENTILATION
Chang - Clinical application of Mechanical Ventilation
  Effects of MV on organs – Ch. 2
  Classification of ventilators; Ch. 3, p. 51-76
  Operating modes of MV - Chp 4
  Indications for MV (very small section) - Chp 8
Journal Articles:
  - Hopper K, Haskins SC, Kass PH, et al. Indications, management, and
    outcome of long-term positive-pressure ventilation in dogs and cats: 148

Lecture 11b
PULMONARY THROMBOEMBOLISM
To be determined (See Courselink)

PREVIOUS READINGS:
West Pulm Pathophysiology Chapt 6 Vascular Diseases (Pulmonary Embolism pg
104-112)
New H, Byers CG. Pulmonary Thromboembolism. Compendium on Continuing
Education for the Practicing Veterinarian September 2011;
Current Vet Therapy XIV
  - Chapters 155 (PTE), 156 (Pulmonary hypertension)
Ettinger’s Textbook of Internal Medicine
- Chapter 233 (pulmonary hypertension & PTE).

**Lecture 12a**
**MV – OPTIMIZING VENTILATION, LUNG PROTECTIVE STRATEGIES, PERMISSIVE HYPERCAPNIA**
Chang - Clinical application of Mechanical Ventilation
- Initiation of MV - Chp 8
- Management of MV - Chp 12

**Journal Articles**
- ARDSNet NEJM 2000 (Seminal paper)
- Effects of hypercapnia and hypercapnic acidosis on hospital mortality in MV patients CCM 2017

**Lecture 12b**
**ASTHMA & BRONCHITIS IN CATS**

**Supplemental readings:**

**Lecture 13a**
**BRONCHITIS IN DOGS**
Textbook of Small Animal Internal Medicine- 8th edition, Ettinger SJ.
Chapter 97: Respiratory and Inhalant Therapy

**Lecture 13b**
**MONITORING – PULSE OXIMETRY, CAPNOGRAPHY, BLOOD GAS ANALYSIS, & CO-OXIMETRY**
See Courselink for Readings
- Pang D, et al. Partial pressure of ETCO$_2$ sampled via intranasal catheter as a substitute for PaCO$_2$ in dogs. JVECC 2007; 17 (2). (ACVECC reading list 2017)

**Lecture 14a**
**MV – PATIENT ASYNCHRONY & INTERPRETATION OF LOOPS AND WAVEFORMS**
Ventilator waveform analysis- Chp 11 Chang
American Thoracic Society Tutorial

Journal Articles:
- Ventilator waveform interpretation in MV small animals Corona JVECC 2011
- Ventilator waveform interpretation Mellema bTopics in Comp Anim Med 2013

Lecture 14b
WHAT IS NEW IN THE NOSE
See Courselink for Readings

Lecture 15a
WEANING FROM THE VENTILATOR
Management of MV, Weaning - Chp 12, 16 Chang
Journal Articles:
- Executive SUMMARY liberation from MV in critically ill adults Chest 2017
- Liberation from MV for critically ill adults Clinical Practice Guidelines Chest 2017
- Girard et al-2016- American Journal of Respiratory and Critical Care Medicine
- Cuff leak test to predict post extubation airway obstruction in adults metaanalysis CCM ABSTRACT 2017

Lecture 15b
OXYGEN TOXICITY

Previous Readings:
Oxygen Supplementation and O₂ toxicity
Vet Clinics of N Am, Sm An Pract Critical Care: Respiratory Focus Sept 2002
O₂ Therapy and Toxicity
Advanced Therapies in Respiratory Disease
VCNA Sept 2007 Respiratory

EXAM

General information for graduate courses:
E-mail Communication
As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.
When You Cannot Meet a Course Requirement
When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date
Courses that are one semester long must be dropped by the end of the fortieth class day (Friday November 3, 2017). The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments
Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility
The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.
The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Recording of Materials
Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources
The Academic Calendars are the source of information about the University of Guelph’s procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.