

Course Syllabus
Department of Physical Therapy
College of Public Health and Health Professions

RSD6930: Control of *Breathing and Airway Defense: Implications for Rehabilitation*

(3 credit hours)
Spring Semester, 2022

Thursdays 1:55 to 4:55 pm

Communicore: **C1-003** (unless otherwise specified)

Lead instructor:

Gordon S. Mitchell, PhD

gsmitch@php.ufl.edu

Office: McKnight Brain Institute L1-120

Instructors:

Respiratory physiology fundamentals:

Gordon Mitchell: properties of gases, lung & chest wall function, ventilation & gas exchange, causes of hypoxemia, neural control of breathing.

Special topics in control of breathing and airway defense:

Jerome Dempsey, PhD, U. Wisconsin (Emeritus)	Sleep disordered breathing, adaptations to hypoxia, breathing during exercise
Erica Levitt, PhD, Pharmacology & Therapeutics	Respiratory rhythm generation; opiate-induced respiratory depression.
Maria Nikodemova, PhD, Physical Therapy	Epidemiology of obstructive sleep apnea
Gordon Mitchell, PhD, Physical Therapy	Respiratory neuroplasticity
Emily Fox, DPT/PhD, Physical Therapy/Brooks	Breathing after spinal cord injury
Leah Reznikov, PhD, Physiological Sciences	Neural control of airway function & asthma
Alicia Vose, CCC-SLP/PhD, Physical Therapy/Brooks	Swallowing & breathing
Erica Dale, PhD, Physiology and Functional Genomics	Experimental therapeutics to restore breathing after SCI
Barbara Smith, DPT/PhD, Physical Therapy	Human neuromuscular disease & breathing
David Fuller, PhD, Physical Therapy	Experimental therapeutics in animal models of neuromuscular disease
Karen Hegland, CCC-SLP/PhD, SLHS	Cough in neuromuscular disease
Paul Davenport, PhD, Physiological Sciences	Respiratory sensation
Don Bolser, PhD, Physiological Sciences	Mechanisms of cough

Laboratory Demonstrations (?):

- Rodent breathing & neurophysiological/EMG recordings of respiratory activity (Mitchell lab)
- *In vitro/in situ* neurophysiology preparations in rodents (Levitt Lab)
- Breathing assessment in humans with spinal injury (Zoom from Brooks Rehabilitation; Fox lab)

Related seminars and symposia during spring, 2022

January 7 & 14	Therapeutic Intermittent Hypoxia Workshops
February 11	International Online CoBAD Seminar Series resumes (alternate Fridays)
March 17-18:	NMPT/BREATHE Symposium
April 2-5	Experimental Biology Meeting (Philadelphia)
April 14	Seminar by Greg Funk in Department of Physiology

Course Purpose

Understand fundamental elements of respiratory physiology, history of medical discovery, essential mechanisms of breathing control (rhythm generation, sensory feedback/chemoreflexes, modulation and plasticity, exercise, sleep) and airway defense (cough, swallowing, coordination with breathing), and challenges to breathing and airway defense with injury and/or disease (sleep apnea, SCI, ALS, stroke, Parkinson's Disease). We plan to demonstrate some methods necessary to conduct research in these critical areas. Throughout the class, there will be an emphasis on rehabilitation in clinical disorders that compromise breathing and/or airway defense.

Course structure:

- Meetings on Thursdays from 1:55 to 4:55 pm.
- Assigned outside readings.
- Class sessions vary in content, but typically consist of 1-2 lectures, followed by discussions and/or laboratory demonstrations.

Course Objectives

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

- *Understand fundamentals of respiratory physiology*
- *Understand respiratory control and airway defense in health and with injury/disease.*
- *Describe how plasticity impacts the control of breathing and airway defense.*
- *Describe relationships between basic studies of respiratory plasticity and clinically important problems, using spinal injury, sleep apnea and neuromuscular diseases as examples.*
- *Appreciate particular experimental methodologies used to study breathing and airway defense, or to diagnose and treat respiratory deficits with injury or disease*

Course Materials

- Book readings, articles from the scientific literature or notes provided by the instructor.

Weekly assignments

- Carefully read assigned notes & papers.

Semester assignment

- Students will conceive of a project that could form the basis for a grant proposal. With this proposal in mind, the assignment is to write up the "specific aims" with adequate background in no more than two pages, single-spaced. These aims will be turned in at the end of the semester. I encourage student groups to critique one another's aims prior to turning them in.
- Assignment details will be discussed in class.

Prerequisites

- Permission of the instructor required. Students taking the course for credit should have fundamental understanding of chemistry, physics and biology, with particular emphasis on physiology, neuroscience and/or rehabilitation sciences.

Grading

- Grades based on participation in class (10%), midterm (30%), final exam (30%) and specific aims for a grant to be submitted at the end of the semester (30%).

Office hours

There will be no specific office hours. Please email to set up an appointment.

Course Materials and Technology

Class materials

Readings will be emailed to students prior to class.

For technical support for this class, please contact the UF Help Desk at:

- helpdesk@ufl.edu
- (352) 392-HELP - select option 2
- <https://helpdesk.ufl.edu/>

Additional Academic Resources

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information.](#)

On-Line Students Complaints: [View the Distance Learning Student Complaint Process.](#)

Professional Behavior

Professional behavior is exemplified by:

1. attendance to all classes and labs,
2. timeliness,
3. attentiveness,
4. respectful and polite interaction with peers and instructors,
5. active learning as demonstrated by questions and discussion.

Laptop policy

Laptop computers are permitted for taking notes and pursuing scientific information in class. Personal use of the internet, such as email, is not permitted in class.

Grading

Each week, the instructor will assign a score of 0-2 for "participation" as follows: 0=no participation; 1=minor participation; 2=active participation

Scale:

90-100%	= A	4.0 grade point
85-89%	= B+	3.5 grade point
80-84%	= B	3.0 grade point
75-79%	= C+	2.5 grade point
70-74%	= C	2.0 grade point
65-69%	= D+	1.5 grade point
60-64%	= D	1.0 grade point

< 60% = E 0 grade point

Please be aware that a grade below as C is not an acceptable grade for graduate students. The GPA for graduate students must be 3.0 based on 5000 level courses and above to graduate. A grade of C counts toward a graduate degree only if based on credits in courses numbered 5000 or higher that have been earned with a B+ or higher.

More information on UF grading policy may be found at:
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>
<http://gradschool.ufl.edu/students/introduction.html>

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Professionalism and COVID

As students pursuing a path in the health professions or public health, it is crucial to demonstrate professional behaviors that reflect integrity and commitment to the health of patients, fellow health professionals, and to populations we serve. To accomplish this, a strong responsibility for the well-being of others must be evident in our decisions, along with accountability for our actions. Professionalism in the health disciplines requires adherence to high standards of conduct that begin long before graduation. This is particularly true during times of health emergencies such as the COVID pandemic, given our professional habits can have a direct impact upon the health of persons entrusted to us.

If you are not vaccinated, get vaccinated. Vaccines are readily available at no cost and have been demonstrated to be safe and effective against the COVID-19 virus. Visit this link for details on where to get your shot, including options that do not require an appointment:

<https://coronavirus.uflhealth.org/vaccinations/vaccine-availability/>.

Students who receive the first dose of the vaccine somewhere off-campus and/or outside of Gainesville can still receive their second dose on campus.

In response to COVID-19, the following professional practices are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to protect the health and safety of ourselves, our patients, our neighbors, and our loved ones.

- You are required to wear approved face coverings at all times while in Health Science Center classrooms and within Health Science Center buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.
- Continue to follow healthy habits, including best practices like frequent hand washing.
- Avoid crowded places (including gatherings/parties with more than 10 people)

Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class. Hand sanitizing stations will be located in every classroom.

Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. If you are withheld from campus by the Department of Health through Screen, Test & Protect you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.

Continue to regularly visit coronavirus.UFHealth.org and coronavirus.ufl.edu for up-to-date information about COVID-19 and vaccination.

COVID-19 Symptoms

See <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html> for information about COVID-19 symptoms, which may include fever, cough, shortness of breath or difficulty breathing, fatigue, chills, muscle or body aches, headache, sore throat, congestion or runny nose, nausea or vomiting, diarrhea, and loss of taste or smell.

Recording Within the Course

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are 1) for personal educational use, 2) in connection with a complaint to the university, or 3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent

may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Policy Related to Required Class Attendance

Attendance is mandatory. Please contact the instructor as soon as possible if you are unable to attend class for any reason. Personal issues with respect to class attendance or fulfillment of course requirements will be handled on an individual basis.

Please note all faculty are bound by the UF policy for excused absences. Excused absences must be consistent with university policies in the Graduate Catalog

(<https://catalog.ufl.edu/graduate/regulations/#text>).

Additional information can be found here:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Policy Related to Guests Attending Class

Only registered students are permitted to attend class. However, we recognize that students who are caretakers may face occasional unexpected challenges creating attendance barriers. Therefore, by exception, a department chair or his or her designee (e.g., instructors) may grant a student permission to bring a guest(s) for a total of two class sessions per semester. This is two sessions total across all courses. No further extensions will be granted. Please note that guests are not permitted to attend either cadaver or wet labs. Students are responsible for course material regardless of attendance. For additional information, please review the Classroom Guests of Students policy in its entirety. Link to full policy: <http://facstaff.php.ufl.edu/services/resourceguide/getstarted.htm>

Online Faculty Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

SUPPORT SERVICES

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, it is strongly recommended you register with the Dean of Students Office <http://www.dso.ufl.edu> within the first week of class or as soon as you believe you might be eligible for accommodations. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations. Please do this as soon as possible after you receive the letter. Students with disabilities should follow this procedure as early as possible in the semester. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The **Counseling and Wellness Center** 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: <http://www.counseling.ufl.edu>. On line and in person assistance is available.

- **U Matter We Care** website: <http://www.umatter.ufl.edu/>. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.
- The **Student Health Care Center** at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: <https://shcc.ufl.edu/>
- Crisis intervention is always available 24/7 from: Alachua County Crisis Center: (352) 264-6789 <http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx>
- **University Police Department:** [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- **UF Health Shands Emergency Room / Trauma Center:** For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#).

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.

Inclusive Learning Environment

Public health and health professions are based on the belief in human dignity and on respect for the individual. As we share our personal beliefs inside or outside of the classroom, it is always with the understanding that we value and respect diversity of background, experience, and opinion, where every individual feels valued. We believe in, and promote, openness and tolerance of differences in ethnicity and culture, and we respect differing personal, spiritual, religious and political values. We further believe that celebrating such diversity enriches the quality of the educational experiences we provide our students and enhances our own personal and professional relationships. We embrace The University of Florida's Non-Discrimination Policy, which reads, "The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act." If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see your instructor or refer to the Office of Multicultural & Diversity Affairs website: www.multicultural.ufl.edu

<p>The schedule, policies, and assignments described in this syllabus are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor, and the students.</p>
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CLASS SCHEDULE

Date	Topic	Leader	Reading	Notes: lab visit, discussions & quizzes
January 6 (C1-003)	Fundamentals of respiratory physiology: need for gas exchange, properties of gases, fundamental respiratory physiology	Gordon Mitchell, PhD (UF)	Lecture notes Supplemental reading: <i>West, Respiratory Physiology-the essentials; and pathophysiology</i>	Assignment challenge: create specific aims for research proposal (due at end of semester). Discussion
January 13	Fundamentals of respiratory physiology: mechanics, ventilation, gas exchange History of premature birth: a case-history of medical discovery	Gordon Mitchell	Lecture notes	Discussion
January 20	Fundamentals of respiratory physiology: causes of arterial hypoxemia	Gordon Mitchell	Lecture notes	Discussion
January 27	Fundamentals: control of breathing (Lectures 1 & 2)	Gordon Mitchell	Lecture notes	Mitchell lab demonstration: Vagal feedback, chemoreflexes, phrenic LTF in rats
February 3	Respiratory System Response to Exercise	Jerry Dempsey	for Exercise lecture- J.Dempsey, J Physiol, 2014 and J Appl Physiol,2020	Discussion
February 10	Fundamentals: Respiratory rhythm generation Opiate induced respiratory depression and failure	Erica Levitt		Levitt lab demonstration: <i>in situ/ex vivo</i> preparations
February 17	Hypoxia: adaptive and maladaptive responses Mechanisms of sleep disordered breathing	Jerry Dempsey	Hypoxia: J. Dempsey, J Appl Physiol, (2014); Physiology 2015 Sleep Apnea J.Dempsey,F1000Rese arch,2019.	Discussion
February 24	Epidemiology of obstructive sleep apnea Respiratory neuroplasticity	Maria Nikodemova Gordon Mitchell	 https://pubmed.ncbi.nlm.nih.gov/12486024/	Discussion
March 3	Midterm Exam Breathing after spinal cord injury (SCI)	Midterm Exam Emily Fox		Midterm exam Draft aims due Brooks Zoom: breathing assessment in people with SCI

March 10 Spring Break	Optional discussion of specific aims and review of class material	Gordon Mitchell		
March 17 NMPT Symposium	Neural control of airway function	Leah Reznikov		Discussion End by 4 pm for NMPT reception (T32 trainees)
March 24	Swallowing and breathing Experimental therapeutics to restore breathing after SCI	Alicia Vose Erica Dale		Discussion
March 31	Breathing in human neuromuscular disease Experimental therapeutics in rodent neuromuscular disease models	Barbara Smith Dave Fuller	https://pubmed.ncbi.nlm.nih.gov/33574581/ https://pubmed.ncbi.nlm.nih.gov/32673075/	Discussion
April 7	Cough in neuromuscular disease Layers of exercise hyperpnea	Karen Hegland Gordon Mitchell	https://pubmed.ncbi.nlm.nih.gov/16530024/	Discussion
April 14	Respiratory sensation Mechanisms of cough	Paul Davenport Don Bolser		Aims Due Discussion
April 28	Final Exam	Final Exam		Final Exam