

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
HPNP 1115 (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, respiratory neuroplasticity.

Control of breathing and airway defense experts:

(Visitors to UF are underlined)

Adrienn Varga, PhD, Neuroscience

Respiratory rhythm generation; opioid-induced respiratory depression.

David Fuller, PhD, Physical Therapy

Experimental therapeutics in animal models of neuromuscular disease/injury

Jerome Dempsey, PhD, U. Wisconsin (Emeritus)

Sleep disordered breathing, adaptations to hypoxia, breathing during exercise

Maria Nikodemova, PhD, Physical Therapy

Epidemiology of obstructive sleep apnea

Emily Fox, DPT/PhD, Physical Therapy/Brooks

Breathing rehabilitation after SCI

Leah Reznikov, PhD, Physiological Sciences

Neural control of airway function & asthma

Karen Hegland, CCC-SLP/PhD, SLHS

Cough in neuromuscular disease

Alicia Vose, CCC-SLP/PhD, Neurology UFHealth JAX

Swallowing & breathing

Erica Dale, PhD, Physiology and Aging

Breathing therapeutics after SCI

Barbara Smith, DPT/PhD, Physical Therapy

Breathing rehabilitation for neuromuscular disease

Don Bolser, PhD, Physiological Sciences

Mechanisms of cough

Paul Davenport, PhD, Physiological Sciences

Respiratory sensation

Jyoti Watters, PhD, U. Wisconsin

Developmental plasticity and adult control of breathing; role of microglia

Tracy Baker, PhD, U Wisconsin

Inactivity induced phrenic motor facilitation

Laboratory Demonstrations:

- Jan. 25: Measuring human breathing, alveolar gas & SaO₂ (BREATHE Core/DB-116)
- Feb 1: Breathing & neurophysiological recordings in rodents (Mitchell/Fuller labs/MBI)
- Feb 8: Rodent *in vitro/in situ* neurophysiology preparations (Varga Lab/MBI)
- March 7: Breathing in humans with spinal injury (Brooks Rehabilitation; Fox lab; virtual)
- April 11: Respiratory sensation in humans (Davenport Lab/College of Veterinary Medicine)

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/breathing coordination). We will then feature challenges to breathing and airway defense with injury and/or disease (sleep apnea, SCI, ALS, stroke, Parkinson's Disease). Select methods critical to research in this field will be demonstrated in BREATHE Center laboratories. Lectures will be delivered by experts in the field, including BREATHE Center faculty and visitors from other Universities. Throughout, we will emphasize rehabilitation in clinical disorders that compromise breathing and/or airway defense.

Conferences during spring, 2024 (not part of course, but some students may be attending)

- February 15-17 APTA CSM meeting (Boston)
- March 12-15 DRS (Puerto Rico)
- March 21-22: NMPT/BREATHE Symposium (UF)
- April 4-7 APS Summit (Long Beach)

Course structure:

- Meetings on Thursdays from 1:55 to 4:55 pm.
- Assigned and optional outside readings.
- Class sessions vary in content, but typically consist of 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 airways.*
- *Describe relationships between basic studies of respiratory plasticity and clinically important problems, using spinal injury, sleep apnea and neuromuscular disease as examples.*
- *Gain familiarity with experimental methodologies used to study breathing and airway defense, or to diagnose and treat respiratory deficits with injury or disease.*

Course Materials & Weekly assignments

- Articles from the scientific literature or notes provided by the instructor.
- Carefully read assigned notes & papers.

Semester assignment

- Students will conceive of a project and write it up as "specific aims" for a grant proposal. The topic (to be improved by the instructor) should be different from studied conducted in the individual student's own research. The assignment is to provide adequate background and propose specific aims (that engage in hypothesis testing) in two pages or less, single-spaced, 0.5" margins. Aims will be turned in at mid-semester, and revised for submission at end of class after receiving a critique from the instructor.
- Assignment details will be discussed in class.

Prerequisites

Permission of instructor required. Students taking course should have fundamental understanding of chemistry, physics & biology, including physiology, neuroscience and/or rehabilitation science.

Grading

Grades based on participation in class (10%), midterm (20%), final exam (35%) and specific aims for a (hypothetical) grant (35%).

Office hours

There will be no specific office hours, but happy to meet on request. Please Email to set appointment.

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/>

Academic Resources

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.](#)

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 for email or social media, 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	60-64% = D	1.0 grade point
85-89% = B+	3.5 grade point	< 60% = E	0 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		

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 UF, the following pledge is 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.

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

We recognize that students who are caretakers may face occasional unexpected challenges creating attendance barriers. Thus, by exception, a department chair or his/her designee (e.g., instructors) may grant a student permission to bring a guest(s). Please note guests are not permitted to attend 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.
- **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)m392-1111 (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.](#)

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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CoBAD CLASS SCHEDULE

Spring 2024

Date	Topic	Leader	Reading	Notes: lab visit, discussions, quizzes
January 11	Fundamentals of respiratory physiology: properties of gases, gas exchange, basic respiratory physiology	Gordon Mitchell	Lecture notes provided Optional reading: <i>West, Respiratory Physiology-the essentials; Respiratory pathophysiology-the essentials</i>	Assignment: specific aims for research proposal (due twice). Demos: gas pressures & movement Discussion
January 18	Fundamentals of respiratory physiology: ventilation, respiratory muscles, mechanics & surfactant	Gordon Mitchell	Lecture notes	Discussion: what are specific aims? Demos: surface tension & negative pressure breathing
January 25	Fundamentals of respiratory physiology: pathophysiological gas exchange	Gordon Mitchell	Lecture notes	BREATHE Center Human Lab visit
February 1	Fundamentals of respiratory physiology: control of breathing	Gordon Mitchell	Lecture notes	Mitchell lab visit: Chemoreflexes, phrenic motor plasticity in rodent model
February 8	Respiratory rhythm generation & opiate induced respiratory depression and failure	Ada Varga	Supplemental reading may be provided	Varga lab visit: <i>in situ</i> & <i>ex vivo</i> preparations
February 15	Experimental therapeutics in rodent neuromuscular disease models Respiratory neuroplasticity	Dave Fuller Gordon Mitchell	https://pubmed.ncbi.nlm.nih.gov/27208699/ https://pubmed.ncbi.nlm.nih.gov/12486024/	Discussion
February 22	Hypoxia: adaptive and maladaptive responses Respiratory System Response to Exercise	Jerry Dempsey Jerry Dempsey	https://pubmed.ncbi.nlm.nih.gov/37494141/ https://pubmed.ncbi.nlm.nih.gov/16530024/	Discussion
February 29	Mechanisms of sleep disordered breathing Epidemiology of obstructive sleep apnea	Jerry Dempsey Maria Nikodemova	Supplemental reading may be provided	Draft aims due Discussion
March 7	Midterm Exam Breathing and spinal cord injury	Midterm Exam Emily Fox	Supplemental reading may be provided	Midterm Exam Virtual Fox lab visit (Brooks Rehab): Breathing rehab in people with SCI
March 14 (no class)	Spring Break	Spring Break	Spring Break	Spring Break
March 21	Control of airway function Cough in neuromuscular disease	Leah Reznikov Karen Hegland	Supplemental reading may be provided	Discussion End by 4 pm (due to NMPT)
March 28	Swallowing and breathing Experimental therapeutics to restore breathing after SCI	Alicia Vose Erica Dale	Supplemental reading may be provided	Discussion

April 4	Breathing in human neuromuscular disease	Barbara Smith	Supplemental reading may be provided	Discussion
April 11	Mechanisms of cough Respiratory sensation	Don Bolser Paul Davenport	Supplemental reading may be provided	Davenport Lab visit: perception testing in humans.
April 18	Gestational challenge impacts adult microglia and respiratory motor plasticity Inactivity induced phrenic motor plasticity	Jyoti Watters Tracy Baker	Supplemental reading may be provided	Discussion
April 25 No class	Optional discussion for those with interest. Not required.	Gordon Mitchell		Revised Aims due
May 2	Final Exam	Final Exam		Final Exam