Course

PHOL 401C: Molecular Bases of Human Physiology (2 credit hour PhD course)

Course Director: Dr. Andrea Romani, MD, PhD
Office E528 – Robbins Building, SoM 4970
Dept. Physiology and Biophysics
Office Phone: 368-1625, Email: amr5@case.edu

Physiology is the dynamic study of life. It describes the vital functions of living organisms and their organs, cells, and molecules interaction. Human body functions depends on how the individual organ systems function, which depends on how the component cells function, which in turn depends on the interactions among subcellular organelles and countless endogenous and exogenous molecules. Understanding physiology requires an integrated understanding of events at the level of molecules, cells, and organs.

Class Format: one 2 hour lecture-based class, to be offered as in-person attendance, in Fall Semester.

Course Description: This PhD course is designed to integrate effectively with Phol 401A and Phol 401B, bringing the knowledge of the PhD students to the next level of integration and organ function. Structured on a 2 h lecture per week (Monday morning, 8.30 to 10.30 am), the course will cover the main molecular determinant and signaling components (e.g. neurotransmitters, hormones, etc.) that regulate the integrated functioning of our main organ systems: respiratory, renal, cardiovascular, gastro-intestinal, central and autonomic nervous systems, and metabolism. The main topics relative to these 6 blocks will be covered in class via lectures, leaving ample opportunity for the students to engage in interactive discussions with the instructor and among themselves.

Upon completion of each organ system, the students will elaborate on a research article as part of their home-assignment. The intent of this 2-page essay is to assess the application of the knowledge provided in-class to the research topic discussed in the paper, and further integrate the student's knowledge of the academic material discussed. The course will conclude with a final mini-essay exam.

Pre-Requisite: PhD and MS Students expected to enroll in this course are required to have completed and passed Phol 401A and Phol 401B, or equivalent. Consent of the course director is required.

Textbook: Textbook: "Medical Physiology" by WF Boron and EL Boulpaep, Elsevier Science, 3rd ed.

Learning Objectives: Learning objectives will be provided by the faculty teaching individual classes or blocks a few days prior to the classes, to give the students the opportunity to read the assigned material (as pages in the textbook). The goal of the learning objectives is to help the students integrate their past knowledge in Phol 401A and Phol 401B with the core concepts of human physiology presented in this course. At the end of each block a pertinent research article will be provided to the students for a written elaboration (see grading)

Detail of the course, and Syllabus

The course is lecture-based, and covers classical human physiology at the molecular and functional level. Class time will be spent highlighting the key functional aspects of essential molecular determinants of organ function, followed by active discussion. Students will receive a set of learning objectives and the related textbook pages prior to each lecture. The students are expected to attend the lecture in person having read the assigned material. The instructor will facilitate the final discussion, asking questions, and giving clarification as needed. Class participation and discussion are integral parts of the course.

- Each organ system is covered in two classes (i.e. two weeks). For each organ system, the students will receive at the beginning of the block a research article selected by the block coordinator. This research article will constitute the home assignment for that block, and the two pages report written by the student is due by the Friday, 5:00 pm of the second week of the block. In the two page assessment, the students will be required to discuss the key physiological aspects presented in class for that organ system and how they relate to the article provided. There will be no article and assessment required for the Integrated Exercise Physiology class (last class of the course). The assessments will be graded by the block coordinator and a copy will be returned to the students within 1 week for any possible discussion about the assigned grading.
- Each student is expected to submit his/her own assignment independent of whether he/she worked together with a class-mate for study purposes. Students should use their own words (aside for technical words) when writing the assignment to avoid possible plagiarism issues.
- A Final Exam (which accounts for 70% of the final grade) will consist of 10-12 mini-essay questions (in two hours) on topics covered in Class. The Final Exam will be administered on paper. The students will be provided with the results of their final exam within 1 week for any possible discussion about the assigned grading.
- Canvas will be used to post power point material prior to each class, as well as the pdf of the research articles to be assessed by the students.

Class Schedule – Fall 2019

Monday: 8.30-10:30am (one 2 hour class per week); Robbins Building – Room E504

Date	Topic	Instructor/Reading Assignment
Neurophysiology		
8/26	Nervous System: CNS circuits, Motor System	Jones (pp. 267-274, 390-407)
9/02	***No CLASS – LABOR DAY***	
9/9	Neurons, Synaptic Transmission & Autonomic nervous system	Smith (310-322, 323-330; 351-370))
Cardiovascular Physiology (Stelzer))		
9/16	Skeletal vs Cardiac vs. Smooth Muscle & Heart as a pump	Stelzer (237-263) (529-553)
9/23	Cardiac Electrophysiology & Control of Cardiovascular Function	Stelzer (504-528) (593-609)
Respiration Physiology (Dr. Boron)		
9/30	Organization & Mechanics of Ventilation & Gas Transport and Diffusion	Boron (590-627) (647-659)
10/07	Gas Exchange: Ventilation and Diffusion & Control of Breathing	Boron (660- 674; 675-699) (700-720)
Renal Physiology (Dr. Garvin)		
10/14	Physiology of Body Fluids, Glomerular Filtration Tubular Reabsorption and Secretion	Garvin (749-760, 762-781) (782-796)
10/21	Renal Regulation of Extracellular Fluid Volume Renal Regulation of Extracellular Fluid Osmolality	Garvin (797-834) (851-880)
Gastro-Intestinal Physiology		
10/28	Overview, Organization, motility	Schilling (883-894)

	Digestion and Absorption	(933-937, 949-968)
11/04	Gastric Function, pancreas and bile function	Romani (895-927)
	Liver Physiology	(981-1000)

Integrated Metabolism

11/11	Endocrine Pancreas and Metabolism	Dubyak (1074-1093)
11/18	Adrenal Gland (glucocorticoids; catecholamine)	Smith (1057-1073)
11/25	Integrated metabolism: Thyroid	Romani (1044-1056)
	Metabolism - Fast vs. Fed	(1000-1007; 1213-1236)

Exercise Physiology (Dr. Dekker)

12/02	Exercise Physiology	Dekker (1074-1093)

12/09 Final EXAM

12/20 FINAL GRADES ARE DUE

Instructors involved in teaching the course: names and e-mails (in alphabetic order)

Boron Walter: wfb2@case.edu
Dubyak George. george.dubyak@case.edu
Garvin Jeff: jeffrey.garvin@case.edu
Jones Stephen: swj@case.edu
Romani Andrea: amr5@po.cwru.edu
Schilling William: wps@case.edu
Smith Corey: corey.smith@case.edu
Stelzer Julian: Julian.stelzer@case.edu

Grading: The final grade of the course consists of two components: 1) Grading of the home assignment relative to each organ systems: overall, this component will represent thirty-percent (30%) of the final grade; i.e. 5% for each organ system-related paper; 2) Final exam: will component will constitute seventy-percent (70%) of the final grade for the course.

Grading: Home assignments = 30% (each home assignment = 5%; i.e. 5 * 6 = 30%)
Final Exam = 70%

Grades A grade: 85 or higher
B grade: 70 to 84
C grade 69 and below

Course Guidelines and Policies: The Students attending the course are expected to abide to proper ethical and professional conduct while in class and at the time of the final exam. No Cell Phone use is allowed in class, and the phones should be on vibrate to avoid disturbing the lecture. The use of tablets and PCs to follow Power Point presentation and note-taking is permitted. No Phone, Tablet, or PC is allowed at the time of the final exam. Phone should be on vibrate and placed at the front of the classroom, to be retrieved at the end of the exam. At the time of the final exam, backpacks should be also placed at the front of the classroom, to be retrieved at the end of the exam.

No last minute contacting of the course director or block coordinator for grade change is acceptable.

Student attendance is on honor base. No attendance sheet will be circulated in class. If a student is unable to attend class or the final exam for health reason or unexpected circumstance, he/she is expected to

communicate timely with the course director, so that proper arrangements can be put in place in case of the final exam.

Late Assignment Policy: If a student is unable to submit the 2 page written assignment by the indicated time, he/she should communicate the reason to the course director to be justified. In the absence of a justification, assignments submitted within 24 hours past the deadline will receive a max score of 4%; Assignments submitted between 24 and 48 hours past the deadline will receive a max score of 2%; Assignments submitted after 48 hours past the deadline will not be graded and will receive a 0 (zero).

If a student is unable to attend the final exam for health reason or unexpected circumstance, he/she is expected to communicate timely with the course director, so that proper arrangements can be put in place for exam make-up.

Disability Accommodations: In accordance with federal law, if a student has documented disability, he/she can request accommodation from Disability Resources (216-3685230). Accommodations determined by Disability Resources will be implemented in the course as indicated. This may result in the 'accommodated' students taking the final exam in the Disability Resources center for proper proctoring.

Please keep in mind that accommodations are not retroactive, and it is responsibility of the student to keep his/her accommodation updated and current.

Academic Integrity: Any violation of the University's Code of Ethics will not be tolerated. All forms of academic dishonesty including cheating, plagiarism, misrepresentation, and obstruction are violations of academic integrity standards and will result in a minimum penalty of receiving a zero for the assignment, the potential for failing the entire course. Cheating includes copying from another's work, falsifying problem solutions or laboratory reports, or using unauthorized sources, notes or computer programs. Plagiarism includes the presentation, without proper attribution, of another's words or ideas from printed or electronic sources. It is also plagiarism to submit, without the instructor's consent, an assignment in one class previously submitted in another. Misrepresentation includes forgery of official academic documents, the presentation of altered or falsified documents or testimony to a university office or official, taking an exam for another student, or lying about personal circumstances to postpone tests or assignments. Obstruction occurs when a student engages in unreasonable conduct that interferes with another's ability to conduct scholarly activity. Destroying a student's computer file, stealing a student's notebook, and stealing a book on reserve in the library are examples of obstruction.

In addition to internal (course-related) consequences, the incident will be reported to the Dean of Undergraduate Studies and Academic Review Board for undergraduates or Senior Associate Dean of Graduate Studies, for Graduate Students. The CWRU Statement of Ethics for graduate students can be found here: http://case.edu/gradstudies/about-the-school/policies-procedures/

Justification for new course: The reason to establish a new physiology course as described is three-fold: 1) to provide the enrolled PhD students with a better understanding of the molecular determinants that regulate the physiological functioning of our organ systems; 2) to better integrate these functions with the molecular operation of specific proteins and cellular components as provided in Phol 401A and Phol 401B courses (taken in the previous semester); 3) to gain a better appreciation of how dysregulation of these molecular determinants may result in the onset or progression of major human diseases (e.g. CFTR and cystic fibrosis; K+ channels and long QT syndrome, adipokines and obesity, etc.). This latter aspect will also help the student integrating his/her knowledge with the research he/she may be carrying out in various laboratories during the PhD rotations and the PhD thesis project.

It is our anticipation that this course will provide a much needed opportunity for our PhD students to better appreciate how physiological unfold, and pathophysiological conditions arise, and to apply their knowledge to topics addressed in their research rotation and thesis.