

Advanced Renal Physiology and Pathophysiology

Course Syllabus

Course Number: GMS 6414

Credit Hours: 2 credit hours

Course Format: This online course is tailored for asynchronous distance learners.

COURSE DESCRIPTION

This is an advanced graduate class, also suitable for postdoctoral students, which will expose students to several aspects of kidney function, as follows: Physiological control of glomerular filtration and glomerular function in renal disease; regulation of renal sodium excretion; morphology of renal transporters; renal mechanisms of acid-base balance; the renal physiologic responses to normal pregnancy. The teaching faculty is drawn from a wide range of disciplines and all are actively involved in research on their areas of expertise.

The structure of this course involves 1) Lectures by research faculty on areas of their expertise; 2) assigned readings; 3) examinations on the lecture material; and 4) a term paper.

TARGET AUDIENCE

This course is designed for individuals wishing for an in-depth understanding of kidney physiology and pathophysiology. This course will be useful for students who have not met the entry requirements for medical school and who are interested in a career in cardiovascular and/or nephrology medicine, and for those wishing to enhance their applications into Masters and Ph.D. programs in the medical sciences in renal research.

PREREQUISITES

This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics. In addition, Principles of Medical Physiology (GMS6400) is required.

To access the journal articles from off-campus, students must use UF's VPN (virtual private network). Instructions and installers for various operating systems can be found at: <https://net-services.ufl.edu/provided-services/vpn/clients/> (use your Gatorlink account to log in).

To view the online videos, a high-speed internet connection is required, as well as a web browser with the latest Microsoft Silverlight plugin installed.

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CONTACTS

The co-directors of the course are Charles E. Wood, Ph.D., Professor of Physiology and Functional Genomics (woodc@ufl.edu) and Jaya Kolli, M.D., Lecturer in Physiology (jkolli@ufl.edu).

SCHEDULE

This is a semester long course that is offered each semester. It is designed to be taken as part of the Medical Physiology Certificate course and should be preceded by GMS 6400C and GMS6410. The course can be taken concurrently with GMS6410 and/or GMS6413.

COURSE GOALS

The kidney is the primary regulator of all the body fluid compartments and controls both volume and composition. The course explores: 1) the mechanisms by which filtration of fluid occurs at the glomerulus; 2) some current ideas on the causes of progression of chronic kidney disease; 3) molecular aspects of structural and functional regulation of renal sodium excretion; 4) advances in the molecular understanding of the kidney and acid base balance; 5) the complex renal adaptations that occur in renal hemodynamics and sensing and control of sodium balance during normal pregnancy.

LEARNING OUTCOMES

Upon completion of this course, students will be able to:

1. Understand how the renal circulation and the tubular epithelium play unique and interdependent roles in the regulation of body fluid balance and composition.
2. Understand the hemodynamic control of GFR and that nitric oxide (NO) and angiotensin II (Ang II) exert opposing physiological actions. Also, to appreciate how an imbalance between NO and Ang II contributes to chronic kidney disease.
3. Understand the consequences of a loss of renal function and how this may progress in chronic kidney disease.
4. Understand how the collecting duct plays a key role in the final regulation of total body sodium.
5. Understand the importance of ammonia transporters in the renal mechanism of acid base balance.
6. Learn how renal hemodynamics and sodium balance are controlled in normal pregnancy.
7. Develop and in depth understanding of some of the research contributions that are shaping our current views on kidney physiology and pathophysiology.

LEARNING RESOURCES

1. Recorded lectures with PowerPoint presentations and PDF handouts of the lectures (which may include additional explanatory material) is provided on the course website.
2. Required text: There is no required textbook although general background information can be obtained the online version of "*Berne & Levy Physiology, 6th Edition, Updated*" 2010. Author: Bruce M. Koeppen & Bruce A. Stanton. ISBN: 9780323073622. This is the required textbook for the preceding "Principles of Medical Physiology course (GMS 6400C)".
3. Links to original articles are provided which access through the UF library system linked to PUBMED. These original articles are supplemental to the lectures.

EXAMINATIONS AND GRADING

There are 2 examinations. Both exams are open book. You will receive an MS Word document with questions and space for answers. This will be provided 2 ½ weeks before the exam is due.

You will be assigned a topic for an assigned essay. You will be expected to write a short essay (5-10 pages of text, double spaced; no more than 30 references). The topic will be assigned to you, but you will also be given the opportunity to choose your own topic with the approval of the course director.

A numerical grade will be given for each graded component of the course.

Grading scale:

A numerical grade will be given at the end of the course and will be scored as follows:

93-100%	= A
90-92%	= A-
87-89%	= B+
83-86%	= B
80-82%	= B-
77-79%	= C+
73-76%	= C
70-72%	= C-
67-69%	= D+
63-66%	= D
<63%	= E

GRADING POLICY

The 2 open book exams will consist of “short note” questions, and each is worth 35% of the final grade. The assigned essay will be worth 30% of the final grade.

ACADEMIC HONESTY

Please review the complete policy of the University of Florida regarding academic dishonesty, found in the online student handbook at:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

Students are expected to abide by the University of Florida Academic Honesty Guidelines and to adhere to 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.

On all work submitted for credit by students at the university, the following pledge is either required or implied: ***"On my honor, I have neither given nor received unauthorized aid in doing this assignment."***

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2 credits

LECTURES:

1. Renal Hemodynamics I	Dr. Baylis
2. Renal Hemodynamics II	Dr. Baylis
3. Renal Hemodynamic Adaptations in Normal Pregnancy I	Dr. Conrad
4. Renal Hemodynamic Adaptations in Normal Pregnancy II	Dr. Baylis
5. Renal Sodium Transport: Signaling Events	Dr. Gumz
6. Circadian Clock and Kidney Function	Dr. Gumz
7. Sodium Handling in Pregnancy	Dr. Baylis
8. States of Dysregulated Sodium Handling	Dr. Gumz
9. Nitric Oxide and Angiotensin II in Renal Hemodynamics	Dr. Baylis
10. Derangements of NO and AngII in Renal Disease	Dr. Baylis
11. Chronic Kidney Disease	Dr. Tantravahi
12. Pathogenesis of Glomerular Diseases	Dr. Clapp
13. Acid Base Physiology I: General Considerations	Dr. Weiner
14. Acid Base Physiology II: Ammonia Transporters	Dr. Weiner
15. Morphology of the Tubule and Renal Transporters	Dr. Verlander

Examinations: There will be 2 short note examinations that will be take-home examinations based on the lectures. The first exam will cover lectures 1-7, and the second examination will cover lectures 8-12.

Term paper (assigned essay): Please use the following as a guide for your term paper. Remember that this is not an examination. It is a paper, in which you will search the appropriate literature and cite primary literature or reviews (not basic textbooks). You are limited to a total length (without references) of 5-10 pages double spaced, and you are limited to 30 references.

Assigned topic for term paper:

Chronic kidney disease (CKD) is a life-threatening condition with significant mortality.

Specific assignment: 1) write a short review of CKD; 2) explain the treatment options for CKD; and 3) use your knowledge of physiology to identify one discovery would be most beneficial for designing new treatments for CKD.