

Principles of Medical Physiology

Course Syllabus

Course Number: GMS 6400C

Credit Hours: 6 credit hours

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

COURSE DESCRIPTION

Principles of Medical Physiology (GMS6400C) teaches the functions of the human body at a level required for clinical medicine. The course covers normal physiology, as well as selected diseases. Concepts are organized by systems: Endocrine, Cardiovascular, Respiratory, Renal and Gastrointestinal. Additional content includes a Foundational Basics introductory section on the cell, body fluids and autonomic nervous system and a final Integration section which applies the physiological principles learned to special situations (Pregnancy, Aging, Exercise, Stress). The ultimate goal is for students to develop an understanding of the integrated functions of the normal body and “problem solving” and “critical thinking” skills in evaluating clinical situations. Each recorded lecture lasts ~20 – 30 min.

TARGET AUDIENCE

This course is designed to meet the needs of individuals wanting to pursue a career in medicine or biomedical research. This course will provide a foundation for students who have not met the entry requirements for medical school and for those wishing to enhance their applications into Masters and PhD programs in the medical sciences.

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. **A minimum undergraduate GPA = 2.0 is required for admission.**

CONTACTS

Jaya Kolli, M.D., Professor of Physiology and Functional Genomics, jkolli@ufl.edu; Tel: 352-273-8693.

Peter Sayeski PhD, Professor of Physiology and Functional Genomics, psayeski@ufl.edu; Tel: 352 392-1816.

SCHEDULE This is a 15 week course that is offered in the spring, fall and summer.

COURSE GOALS

Physiology is the science of how the body functions, and is the basis for understanding modern clinical medicine and the biomedical sciences. This course will provide: 1) a foundation understanding of the basic functions of the human body; 2) knowledge of the physiology of the major systems: endocrine, cardiovascular, muscle, respiratory, renal, and gastrointestinal, as well as selected diseases that affect these systems; 3) integration of these individual facts in order to understand how organ systems work independently and interdependently in the body. One example of this integration is in the control of acid base balance. Other examples covered in this course are in the integrated responses to pregnancy and exercise as well as pathophysiologic responses to aging.

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

1. Understand the normal functions of the individual body systems at a level required for an understanding of clinical medicine.
2. Understand how these systems act in an integrated manner to regulate overall body functions.
3. Understand how failure of these normal physiologic functions and integrations are associated with some diseases.
4. Demonstrate the ability to apply physiological principles of clinical relevancy by multiple choice examinations and Quiz exercises.

LEARNING RESOURCES

1. Recorded video lectures with PowerPoint presentations will be provided on the course website.
2. Recorded video clinical correlation(s) and/or case studies relating to the basic science material.
3. Lecture notes for each video lecture are available as PDF downloads enabled for direct note taking.
4. Opportunity for clarification of the material via email.
5. Practice on-line quizzes (not for grade) to advance the understanding of the material provided in lectures.
6. Example exam questions (not for grade) to test knowledge and prepare for each examination.
7. Recommended text (not required, but highly recommended): "*Medical Physiology: The Big Picture*". Authors: Johnathan Kibble & Colby Halsey. ISBN: 9780071485678.
Free online: <https://accessmedicine.mhmedical.com/book.aspx?bookid=1291>.
8. Recommended text (not required, but highly recommended): "*Ganong's Review of Medical Physiology, 26th Edition*" 2019. Authors: Kim E. Barrett, Susan M. Barman, Heddwen L. Brooks, & Jason X.J. Yuan. ISBN: 9781260122404. Free online: <https://accessmedicine.mhmedical.com/book.aspx?bookid=2525>.
9. Recommended text (not required, but useful): Student may wish to supplement the course videos and PDF handout by purchasing an online version of "*Berne & Levy Physiology, 7th Edition*" 2018. Author: Bruce M. Koeppen & Bruce A. Stanton. ISBN: 9780323393942.

COMMUNICATION WITH FACULTY

If a student is unclear regarding parts of a topic, the student is encouraged to contact the relevant lecturer via Canvas messaging.

STRUCTURE OF CONTENT

The course content is structured into Blocks. The six Blocks are: Foundational Basics+Endocrine Part 1; Endocrine Part 2; Cardiovascular+Muscle; Respiratory; Renal; and Gastrointestinal+Integrated Physiology. The content of the Blocks is shown later in this syllabus.

COURSE CALENDAR and RECOMMENDED TIME MANAGEMENT

The calendar of all course event is shown in an accompanying figure. The videos and corresponding PDF notes are available throughout the entire time the course is open, from the first day through the end of the course on the day the grades are reported to the Registrar. Also, each Exam is available to complete at any time during the semester. For each Block the course content lecture titles should be viewed in the order shown later in this syllabus. For Block 1 and Block 6 in particular, note in the following Figure our recommended calendar dates

for breakdown of when to view the videos and PDFs of the content in those Blocks—as a guide to help in managing time, students may use these recommendations or may alternatively adapt your own learning pace.

EXAMINATIONS AND GRADING

There will be 6 multiple choice examinations, each covering the contents of a Block. Exam 1 covers Foundational Basics + Endocrine Part 1; Exam 2 covers Endocrine Part 2; Exam 3 covers Cardiovascular + Muscle, Exam 4 covers Respiratory, Exam 5 covers Renal, and Exam 6 covers Gastrointestinal + Integrated Physiology. All exams will be monitored by ProctorU, a UF chosen service that allows the students to complete their exams at home while still ensuring academic integrity. Students will take all examinations at a computer that meets the technical requirements of ProctorU including a web cam and microphone. Students will make the arrangements for exam proctoring. **We recommend you make an appointment with ProctorU at least two weeks in advance of each exam date.** All costs of these exams are covered in the registration costs. You may schedule your exams any time during the semester, as long as the exams are scheduled by the due date listed on the exam in Canvas. Scores are reported as a percent. The points used to compute final grades will be determined after all exams have been completed. The final grade is based simply on the overall percentage of points covering all 6 Exams; in other words the contribution of each Exam to the final percentage is weighted according to the number of questions on each Exam. The final letter grade for the entire course will be issued within 72h after the due date for the six exams.

Grading scale: A final numerical score for the entire course will be computed at the end of the semester for each student. After dropping his/her single lowest exam, the points will then be computed based on the five remaining exam scores. The faculty may also factor in other considerations in adjusting scores to a possibly higher score. A final letter grade will be assigned as follows, per University of Florida standards:

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

There are no make-up exams unless otherwise granted by the course coordinator prior to an examination date. Failure to take an exam without prior permission from the course coordinator will be recorded as 0.

ACADEMIC HONESTY

Please review the complete policy of the University of Florida regarding academic dishonesty, found in the online student handbook at: <http://graduateschool.ufl.edu/media/graduate-school/pdf-files/handbook.pdf>

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 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."

COURSE EVALUATION POLICY

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/>.

BLOCK 1

PHYSIOLOGY FOUNDATIONAL BASICS

Section Coordinator Jaya Kolli M.D. (jkolli@ufl.edu)

Introduction to Foundational Basics Section	Stevens
Transporters, Pumps, and Channels – Part I	Stevens
Transporters, Pumps, and Channels – Part II	Stevens
Physiology of Voltage & Concentration Gradients – Part I	Stevens
Physiology of Voltage & Concentration Gradients – Part II	Stevens
Body Fluids I	Baylis
Body Fluids II	Baylis
Receptors and Signaling – Part I	Sumners
Receptors and Signaling – Part II	Sumners
Autonomic Nervous System – Part I	Scheuer
Autonomic Nervous System – Part II	Scheuer
Autonomic Nervous System – Part III	Scheuer

ENDOCRINE Part 1

Section Coordinator Jaya Kolli M.D. (jkolli@ufl.edu)

Introduction to the Endocrine Section	Conrad
Introduction to Endocrinology Physiology	Sumners
Hypothalamus and Pituitary – Part I	Sumners
Hypothalamus and Pituitary – Part II	Sumners
Adrenal Medulla – Part I	Sumners
Adrenal Medulla – Part II	Sumners
Adrenal Cortex – Part I	Wood
Adrenal Cortex – Part II	Wood
Thyroid Hormones – Part I	Sumners
Thyroid Hormones – Part II	Sumners

Clinical Correlation: Thyroid – Part I

Winter

Clinical Correlation: Thyroid – Part II

Winter

Quiz covering Foundational Basics plus Endocrine Part 1

Faculty

*** Block 1 Multiple Choice Exam #1 on Foundational Basics + Endocrine Part 1**

Sample Syllabus

BLOCK 2

ENDOCRINE Part 2

Section Coordinator Jaya Kolli M.D. (jkolli@ufl.edu)

Calcium/Phosphate Regulation - Part I	Sumners
Calcium/Phosphate Regulation – Part II	Sumners
Calcium/Phosphate Regulation – Part III	Sumners
Calcium Phosphate Regulation – Par IV	Sumners
Fluid Balance & Cardiovascular Control	Sumners
Growth Hormone – Part I	Raizada
Growth Hormone – Part II	Raizada
Blood Glucose Regulation – Part I	Raizada
Blood Glucose Regulation – Part II	Raizada
Blood Glucose Regulation – Part III	Raizada
Reproduction (Sexual Differentiation – Part I)	Conrad
Reproduction (Sexual Differentiation - Part II)	Conrad
Reproduction Male – Part I	Conrad
Reproduction Male – Part II	Conrad
Reproduction Female – Part I	Conrad
Reproduction Female – Part II	Conrad
Reproduction Female – Part III	Conrad
Reproduction Female – Part IV	Conrad
Reproduction Pregnancy – Part I	Conrad
Reproduction Pregnancy – Part II	Conrad
Reproduction Pregnancy – Part III	Conrad
Reproduction Pregnancy – Part IV	Conrad
Special Topic: Carbohydrate Metabolism in Pregnancy	Conrad
Clinical Correlation : Assisted Reproductive Technologies – Part I	Rhoton
Clinical Correlation: Assisted Reproductive Technologies – Part II	Rhoton
Quiz	Faculty

BLOCK 3

*** Block 2 Multiple Choice Exam #2 on Endocrine Part 2**

MUSCLE and CARDIOVASCULAR

Section Coordinator Erin Bruce Ph.D. (ebruce5@ufl.edu)

The Structure of Muscle	Walter
The Molecular Structure of Muscle	Walter
Muscle Function and Regulation – Activation	Walter
Muscle Function and Regulation – Force Modulation I	Walter
Muscle Dysfunction and Disease – Force Modulation II	Walter
Comparing Skeletal and Cardiac Muscle	Walter
Comparing Skeletal, Cardiac and Smooth Muscle	Walter
Clinical Correlation-Muscular Dystrophy	Walter
Introduction to Cardiovascular Physiology I Introduction to Cardiovascular Physiology II	Kolli
Cardiac Cycle	Kolli
Electrocardiogram I	Kolli
Electrocardiogram II	Kolli
Electrocardiogram III	Kolli
Cardiac Ion Channels I	Kolli
Cardiac Ion Channels II	Kolli
Quiz 1	Faculty
Hemodynamics, Arteries I	Wood
Hemodynamics, Arteries II	Wood
Venous Return	Wood
Fetal Circulation	Wood
Pulmonary Circulation I	Scheuer
Pulmonary Circulation II	Scheuer
Neural Control I	Scheuer
Neural Control II	Scheuer
Neural Control III	Scheuer
Local Control of Blood Flow	Kolli
Regulation of Arterial Pressure	Kolli
Microcirculation	Kolli
Integrated Control of Cardiovascular System I	Kolli
Integrated Control of Cardiovascular System II	Kolli
Shock and Heart Failure – Clinical correlation	Kolli
Quiz 2	Faculty

*** Block 3 Multiple Choice Exam #3 on Muscle and Cardiovascular**

RESPIRATORY PHYSIOLOGY

Section Coordinator: Peter P. Sayeski Ph.D. (psayeski@ufl.edu)

BLOCK 4

Introduction to Respiration Section	Sayeski
Introduction and Functional Anatomy	Sayeski
The Respiratory Pump and Lung Volumes	Sayeski
Lung Compliance Part I Lung	Sayeski
Compliance Part II	Sayeski
Airway Resistance Part I	Sayeski
Airway Resistance Part II	Sayeski
The Work of Breathing Part I	Sayeski
The Work of Breathing Part II	Sayeski
Alveolar Ventilation and Gas Composition Part I	Sayeski
Alveolar Ventilation and Gas Composition Part II	Sayeski
Gas Diffusion Part I	Sayeski
Gas Diffusion Part II	Sayeski
Oxygen Transport Part I	Sayeski
Oxygen Transport Part II	Sayeski
Quiz 1	Sayeski
Oxygen Content Part I	Sayeski
Oxygen Content Part II	Sayeski
CO ₂ Transport and Content	Sayeski
<i>Clinical Correlation: O₂ and CO₂ Assessment Part I</i>	Sayeski
<i>Clinical Correlation: O₂ and CO₂ Assessment Part II.</i>	Sayeski
Pulmonary Circulation Part I	Sayeski
Pulmonary Circulation Part II	Sayeski
<i>Clinical Correlation: Pulmonary Edema Part I</i>	Sayeski
<i>Clinical Correlation: Pulmonary Edema Part II</i>	Sayeski
Acid-Base Part I	Sayeski
Acid-Base Part II	Sayeski
Respiratory Control Part I	Sayeski
Respiratory Control Part II	Sayeski
High Altitude Respiration	Sayeski
Quiz 2	Sayeski
<i>Clinical Correlation: Case Studies Part I</i>	Sayeski
<i>Clinical Correlation: Case Studies Part II</i>	Sayeski

*** Block 4 Multiple Choice Exam #4** on Respiratory Physiology

RENAL

Section Coordinator Jaya Kolli M.D. (jkolli@ufl.edu)

Introduction to Renal Physiology Section	Baylis
General Functions of the Kidney. Renal Anatomy	Baylis
Clearance- Part I	Baylis
Clearance Part II	Baylis

BLOCK 5

Renal Hemodynamics – Part I	Baylis
Renal Hemodynamics – Part II	Baylis
Renal Hemodynamics – Part III	Baylis
Renal Hemodynamics – Part IV	Baylis
Renal epithelial sodium transport	Baylis
Control of sodium balance – Part I	Baylis
Control of sodium balance – Part II	Baylis
Control of sodium balance – Part III Control of sodium balance – Part IV	Baylis Baylis
Quiz 1	Baylis
Renal handling of Calcium and Phosphate Renal handling of Potassium	Baylis Baylis
Concentration and Dilution – Part I	Baylis
Concentration and Dilution – Part II	Baylis
Concentration and Dilution – Part III	Baylis
Concentration and Dilution – Part IV	Baylis
Acid/Base Balance – Part I	Baylis
Acid/Base Balance – Part II	Baylis
Acid/Base Balance – Part III	Baylis
Kidney Diseases	Baylis
Quiz 2	Baylis

*** Block 5 Multiple choice Exam #5 on Renal Physiology**

GASTROINTESTINAL Section coordinator Shi Jin, Ph.D.
(shijin2015uf@ufl.edu)

Introduction to Gastrointestinal Physiology Section	Stevens
Gastrointestinal Nervous System & Motility Part I	Stevens
Gastrointestinal Nervous System & Motility Part II	Stevens
Gastrointestinal Nervous System & Motility Part III	Stevens
Gastrointestinal Nervous System & Motility Part IV	Stevens
Phases of Digestion and Salivary Gland Physiology	Stevens
Exocrine Pancreas	Stevens
Gastric Physiology Part I	Stevens
Gastric Physiology Part II	Stevens
Small Intestine Epithelium and Protein Digestion/Absorption	Stevens
Carbohydrate Digestion/Absorption	Stevens
Liver and Gallbladder Part I	Stevens
Liver and Gallbladder Part II	Stevens

BLOCK 6

Lipid Digestion and Absorption Part I	Stevens
Lipid Digestion and Absorption Part II	Stevens
GI Electrolytes and Fluids Part I	Stevens
GI Electrolytes and Fluids Part II	Stevens
Summary map of digestion and absorption	Stevens
Study guides: GI hormones and GI regulators	Stevens
Gastrointestinal Commensal Microbiota – Part I	Mai
Gastrointestinal Commensal Microbiota – Part II	Mai
Quiz	Stevens

INTEGRATED PHYSIOLOGY Section Coordinator
Peter Sayeski Ph.D. (psayeski@ufl.edu)

Introduction to Integrated Physiology Section	Baylis
Pregnancy Physiology: Maternal – Part I	Baylis
Pregnancy Physiology: Maternal – Part II	Baylis
Pregnancy Physiology: View from the Fetus	Wood
Aging Physiology: Kidney	Baylis
Aging Physiology: Cardiovascular	Delp
Integration: Muscle and the cardiovascular system	Walter
Exercise Physiology and Cardiovascular – Part I	Delp
Exercise Physiology and Cardiovascular – Part II	Delp
Exercise Physiology and Lungs	Sayeski
Stress Wood Quiz Faculty	

*** Block 6 Multiple choice Exam #6 on Gastrointestinal + Integrated Physiology**