University of Pennsylvania

School of Nursing

N607 - Advanced Physiology and Pathophysiology

Summer, 2013 Syllabus

**Title**: Nursing 607 - Advanced Physiology and Pathophysiology

**Course units**: 1.0 C.U.

**Catalog Description**:

This course will integrate advanced physiology with pathophysiology and clinical implications across the lifespan for advanced nursing practice. Organ systems function and dysfunction from the level of the cell through integrated organ levels will be presented, and the genetic basis of disease will be discussed. Recent scientific advances will be discussed with application to new approaches to disease and symptom management. The interrelationships between basic physiology, clinical pathophysiology, and genetics are emphasized.

**Placement**: Summer semester (Prior to or concurrent with MSN clinicals)

**Time/location**: Friday 9:00 AM – 1:00 PM/Claire M. Fagin Hall Auditorium

**Faculty**: Nancy Tkacs, PhD, RN – Course Director

 Office Room 453 Claire M. Fagin Hall

 E-mail: tkacs@nursing.upenn.edu; phone 215-573-3045

 Joseph R. Libonati, PhD

Office Room 126B Claire M. Fagin Hall

E-mail: jlibonat@nursing.upenn.edu; phone: 215-746-3986

Geetha Muthukumaran, PhD

Office Room 135, Claire M. Fagin Hall

E-mail: geetham@nursing.upenn.edu; phone 215-746-4469

Loretta Sernekos, PhD, MSN, ANP-BC

E-mail:sernekos@nursing.upenn.edu; phone: 856-305-7178

**Teaching** Elaine Morrison-Faino, MSN

**Assistant**: E-mail: morrke@nursing.upenn.edu

**Prerequisite**: Recent (within 5 years), satisfactory completion of undergraduate courses that include Biochemistry, Nutrition, Anatomy and Physiology and junior clinical courses or permission of the instructor. It is expected that enrolled students have reviewed their undergraduate course work in human anatomy and physiology and possess a working knowledge of cell biology, biochemistry, nutrition, and human genetics at the undergraduate level. **Materials in the Preparation Folder for “Week 1 Cell Biology” should be completed prior to the first class on May 24th.**

**Course Overview**:

Functions of the major organ systems across the lifespan and associated pathophysiological concepts are described in lectures. Emphasis is placed on advanced understanding of organ functions at the cellular level, with exemplar major acute and chronic diseases of each organ system. The contribution of genetics and environment to disease processes will be discussed. Through problem-solving exercises students develop the ability to integrate the pathophysiologic basis of clinical findings associated with disease processes.

**Course Objectives**: Students will be able to:

1. Describe and apply advanced principles of biochemistry, biophysics, and cell biology as they relate to physiology and the pathophysiology of disease across the lifespan.
2. Articulate principles of molecular biology and apply this to understanding the molecular and cellular basis of inherited diseases.
3. Describe alterations of cell, tissue, organ and integrative functions associated with a broad range of acute and chronic diseases across the lifespan.
4. Articulate an understanding of the biological underpinnings of developmentally-appropriate health promotion activities and screening aimed at reducing morbidity and mortality.
5. Relate patients' symptoms, physical signs, and laboratory results to underlying pathophysiology in organ systems.
6. Explain the cellular bases for pharmacodynamics of common categories of therapeutic drugs.
7. Demonstrate quantitative and qualitative problem-solving skills and diagnostic reasoning based on physiological and pathophysiological principles.

**Teaching Methods**:

Lecture\*, textbook readings, question assignments, discussions, audiovisual materials, case studies, reviews, course handouts, self-directed online learning modules.

\*Lectures will be delivered both live and via online video.

**Evaluation Methods**:

Objective tests are used to evaluate student performance in the course. Five noncumulative tests will be given. Tests 1, 2, and 4 are each worth 18% of the grade, tests 3 and 5 are each worth 23% of the grade. The weighted average of all 5 tests, without the contribution of homework points, must be ≥ 70% in order to pass the course. A test average of < 70% will be assigned a final course grade of F.

Homework will be assigned to be completed online before class EACH WEEK, beginning with Week 2. Group case study assignments will be equivalent to one week of homework. If the test average is at least 70%, the homework grade will factor into the final course letter grade as follows:

Homework online quiz average: 95-100% adds 2.5 points to exam average

90-94% adds 2.0 points to exam average

85-89% adds 1.5 points to exam average

80-84% adds 1.0 points to exam average

75-79% adds 0.5 points to exam average

Homework grade is the average of all online quiz scores and case study scores.

**Exam Policies**:

Students are expected to take all examinations as scheduled in the Content Outline. All absences from examinations must be reported to the faculty member administering the exam by email within 24 hours of the scheduled exam time. Absence from an examination will be excused only for serious reasons, in

which case a make-up exam will be scheduled at the convenience of the instructor. A student may take only one makeup examination per semester.

Grade Scale: A+ = 97.0 - 100 A = 93 – 96.9 A- = 90 – 92.9

 B+ = 87 – 89.9 B = 83 – 86.9 B- = 80 – 82.9

 C+ = 77 – 79.9 C = 73 – 76.9 C- = 70 – 72.9

A grade of less than 70.0 based on EXAM GRADES ONLY is a failing grade of F in this course.

**UNIVERSITY CODE OF ACADEMIC INTEGRITY**

Since the University is an academic community, its fundamental purpose is the pursuit of knowledge. Essential to the success of this educational mission is a commitment to the principles of academic integrity. Every member of the University community is responsible for upholding the highest standards of honesty at all times. Students, as members of the community, are also responsible for adhering to the principles and spirit of the following Code of Academic Integrity.

**Academic Dishonesty Definitions**

Activities that have the effect or intention of interfering with education, pursuit of knowledge, or fair evaluation of a student’s performance are prohibited. If a student is unsure whether her/his action(s) constitute a violation of the Code of Academic Integrity, then it is that student’s responsibility to consult with the instructor to clarify any ambiguities. Examples of such activities include but are not limited to the following definitions:

* Cheating: using or attempting to use unauthorized assistance, material or attempting to prevent another from using authorized assistance, material or study aids. Example: using a cheat sheet in a quiz or exam, altering a graded exam and resubmitting it for a better grade, etc.
* Plagiarism: using the ideas, data or language of another without specific or proper acknowledgment. Example: copying another person’s paper, article, or computer work and submitting it for an assignment, copying material from Web sites without attribution, failing to use quotation marks where appropriate, etc.
* Fabrication: submitting contrived or altered information in any academic exercise. Example: making up data for an experiment, fudging data, citing nonexistent articles, contriving sources, etc.
* Multiple Submission: submitting, without prior permission, any work submitted to fulfill another academic requirement.
* Misrepresentation of academic records: misrepresenting or tampering with or attempting to tamper with any portion of a student’s transcripts or academic record, either before or after coming to the University of Pennsylvania. Example: forging a change of grade slip, tampering with computer records, falsifying academic information on one’s resume, etc.
* Facilitating Academic Dishonesty: knowingly helping or attempting to help another violate any provision of the Code. Example: working together on a take-home exam, etc.
* Unfair advantage: attempting to gain unauthorized advantage over fellow students in an academic exercise. Example: gaining or providing unauthorized access to examination materials, obstructing or interfering with another student’s efforts in an academic exercise, lying about a need for an extension for an exam or paper, continuing to write even when time is up during an exam, destroying or keeping library materials for one’s own use, etc.

*Adapted from: Office of the Provost, 1996*

**Course information is posted on blackboard:**

[**www.courseweb.upenn.edu**](http://www.courseweb.upenn.edu/)

**Required Text and Additional Chapters :**

1. **Medical Physiology: Principles for Clinical Medicine, 4th Edition by** [**Rodney A. Rhoades**](http://search.barnesandnoble.com/booksearch/results.asp?ATH=Rodney%2BA%2E%2BRhoades) **(Editor),** [**David R. Bell**](http://search.barnesandnoble.com/booksearch/results.asp?ATH=David%2BR%2E%2BBell) **(Editor)**

**• ISBN-13: 9781609134273**

**• Publisher: Lippincott Williams & Wilkins**

1. **Robbins Basic Pathology, 9th edition, by Kumar, Abbas and Aster, only Chapters 1, 2, 3, and 6**

Instructions for purchasing chapters: go to https://www.inkling.com and search for Robbins Basic Pathology, 9th Edition, by Kumar et al. Set up a username and password. Purchase these chapters:

**1 Cell Injury, Cell Death, and Adaptations**

**2 Inflammation and Repair**

**3 Hemodynamic Disorders, Thromboembolism, and Shock**

**6 Genetic and Pediatric Diseases**

Please note: Each chapter costs $4.99, so the total cost for these chapters is less than $20. You will be able to download the chapters to an iPhone or iPad, and you can access the chapters via the web at any time.

**Recommended texts (you do not need to buy any of these):**

McPhee, S.J. and Hammer, G.D. Pathophysiology of Disease: An Introduction to Clinical Medicine, 6th Ed., New York, McGraw-Hill, 2010. ISBN: 978-0-07-162167-0. (free access online at: http://www.library.upenn.edu/biomed → AccessMedicine → Textbooks (Lange Educational Library Basic Science)

Marieb, E.N. and Hoehn, K. Human Anatomy and Physiology, 8th Ed. Benjamin Cummings, 2009. ISBN:

9780805395914. Textbook for NURS 163/164 (undergraduate Anatomy and Physiology at Penn Nursing). Comes with online access to learning aids such as animations and self-tests. **HIGHLY RECOMMENDED** for students who have not taken a physiology course in several years. If you do not have your undergraduate book and notes, you will find it advantageous to study this book before class each week.

Kumar, V., Abbas, A.K., Fausto, N., and Aster J.C. Robbins and Cotran Pathologic Basis of Disease 8th Ed. Philadelphia, Saunders/Elsevier, 2010. ISBN978-1-4160-3121-5. (free access online at: http://www.library.upenn.edu/biomed → Resources for Clinicians → MD Consult → Books → Alphabetically → Kumar)

**CREATING AND MAINTAINING A CLIMATE OF PROFESSIONAL NURSING**

“True learning encourages the spirit of inquiry, excitement of discovery, creative and critical thinking, increased breadth of knowledge, and interactions with others who hold different beliefs and values. The educational climate encourages academic freedom and self-expression based on the assumption that students are active, self-directed, and self-motivated individuals who assume responsibility for their own learning and development.” ~from the School of Nursing Philosophy statement.

As members of the University of Pennsylvania School of Nursing community, we are committed to creating a classroom environment that is built upon a foundation of mutual respect and that fosters a

climate in which student learning is enhanced to the fullest extent. As faculty and students, we value:

* A course that is well-organized and in which the expectations and objectives are clearly communicated.
* An educational experience that is stimulating, engaging, and intellectually challenging.
* A classroom environment that celebrates and values diversity.
* A safe space in which to voice our thoughts and opinions.

We also recognize that the quality of the educational experience is influenced by each member of the classroom community. As students, we play a significant role in shaping the educational climate. It is therefore our responsibility to:

* Be fully present while in class, which includes actively listening while others speak and participating in classroom discussion.
* Challenge our assumptions and seek to learn from the diverse experiences, backgrounds, and opinions that each person brings to the educational environment.
* Provide feedback in a professional and honest manner regarding factors that enhance or inhibit learning in the classroom environment.
* Treat course faculty and fellow students with respect.
* Be a positive ambassador and role model for Penn Nursing.

By upholding these basic principles, we hope to promote a classroom climate that is conducive to the intellectual, professional, and personal development of every student.

(Source: MSN handbook[, http://www.nursing.upenn.edu/students/handbooks/MSN/2006-](http://www.nursing.upenn.edu/students/handbooks/MSN/2006-)

2007%20Handbook%20&%20Grad%20Resource%20Guide.pdf)

**Conduct in the classroom**: Please show respect for your classmates and the course faculty by turning off your cell phone, or by placing it on vibrate. Questions for clarification are permitted during lecture; please do not disrupt class by talking with individuals sitting near you.

**WEEKLY TOPIC OUTLINE/CONTENT**

| **Class Week** | **Date/Topic** | **Content** | **Exemplar diseases and conditions** | **Readings** |
| --- | --- | --- | --- | --- |
| 0 | **Before 5/24: Complete this review before class on Friday** | Review chemistry, biochemistry, biological molecules |  | Review readings and powerpoints (content in week 0 folder in Blackboard) |
| 1 | 5/24Introduction Cell biology | Overview of cell biology: Properties of proteins Membrane transportIon channelsReceptors and second messengersCells and their organellesCell responses to injuryCell death mechanisms | **Ischemic cell death** | Blackboard: Alberts; Ganong; Rhoades & Bell Ch 1 & 2. Kumar Chapter 1(review Pre-semester Concepts slides before class!) |
| 2 | 5/31Genetic principles(Dr. Muthukumaran) | Principles of molecular biology and geneticsGenetic diseasesMutations and cancer | **Osteogenesis imperfecta****Achondroplasia****Fragile X-associated mental retardation****BRCA mutations** | Blackboard: Deniston et al.; Champe et. al.; NEJM ; McPheeKumar Chapter 6 |
| 3 | 6/7 | **Test #1** |
| 3 | 6/7Hematology | Development of blood cellsWhite blood cell structure and functionRed blood cell structure and function Forms of hemoglobinAnemia classes and mechanismsHemostasis and thrombosis | **Pernicious anemia****Iron-deficiency anemia****G6PD deficiency****Disseminated intravascular coagulation****Factor V Leiden** | Blackboard: McPhee; Case studiesRhoades & Bell Ch 9Kumar Chapter 3 |
| 4 | 6/14Immunology & inflammation(Dr. Muthukumaran) | Principles of innate and adaptive immunityProcesses, mechanisms, and mediators of inflammationImmediate hypersensitivity | **Acute inflammation and wound healing****Rheumatoid arthritis****Asthma** | Kumar Chapter 2Rhoades & Bell Ch 10 to p. 207 |

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| --- | --- | --- | --- | --- |
| **Class Week** | **Topic** | **Content** | **Exemplar diseases and conditions** | **Readings** |
| 5 | 6/21 | **Test #2** |
| 5 | 6/21Heart(Dr. Libonati) | Cardiomyocyte electrical and mechanical functionCardiac cycleAutonomic regulationCardiac output control | **Valve disease****Heart failure****Myocardial infarction****Atrial fibrillation****Congenital heart disease** | Guyton Ch 9, 21, 22. (MD Consult)Rhoades & Bell Ch 12 to Ch 13 p. 261; McPhee Ch 10  |
| 6 | 6/28Circulation(Dr. Libonati) | Biophysics of flow and resistanceBlood vessel characteristicsCapillary propertiesControl of resistanceEndothelial function | **Hypertension****Circulatory shock****Edema****Atherosclerosis** | Rhoades & Bell Ch 11,14,15, 17  |
| 7 | 7/5Lungs | Lung mechanicsGas exchangeOxygen transportVentilation/perfusion matchingNeural control | **ARDS****Asthma****Chronic bronchitis****Emphysema****Hypoxemia**  | Rhoades & Bell Ch 18, 19, 20 |
| 8 | 7/12 | **Test #3** |  |  |
| 8 | 7/12Kidneys; Fluid and electrolyte | Nephron structure and functionGlomerular filtration rate and its regulationProduction of concentrated urineRegulation of sodium and water balanceRegulation pH | **Acute tubular necrosis****Glomerulonephritis****Diabetes insipidus****Hyponatremia** | Rhoades & Bell Ch 22Ch 23 to p.446 |
| 9 | 7/19Liver and gastrointestinal | Liver structure and functionLiver enzymesGastrointestinal motilityDigestion and absorption | **Nonalcoholic fatty liver disease****Acute fatty liver of pregnancy****Cirrhosis****GERD****Celiac disease****Infectious diarrhea****Bariatric surgery** | Liver: Blackboard: McPheeRhoades & Bell Ch 27GI:Rhoades & Bell Ch 26McPhee Ch 13 Sections “Stomach and “Acid-Peptic Disease”  |

| **Class Week** | **Topic** | **Content** | **Exemplar diseases and conditions** | **Readings** |
| --- | --- | --- | --- | --- |
| 10 | 7/26 | **Test #4** |
| 10 | 7/26Endocrinology | Endocrine control systemsMetabolismHormone regulation of metabolic pathwaysInsulin synthesis, secretion ,actionsAction of insulin-opposing hormones: glucagon, epinephrine, growth hormone | **Type 1 and 2 diabetes****Obesity****Polycystic ovary syndrome** | Rhoades & Bell Ch 30, to p.598Ch 31 to p.607Ch 32Ch 33, pp.644-648 Ch 34 |
| 11 | 8/2Nervous system | Structure and function of neuronsPrinciples of sensory processingSensory pathway anatomy and physiologyPrinciples of motor functionNeuromuscular junctionAlpha and gamma motor neuronsSpinal reflexes and muscle spindle functionDescending pathways regulating movementCerebellar and basal ganglia functionConcepts in neurotransmissionFunction of glutamate, GABA, acetylcholine, dopamine, norepinephrine, serotonin neuronsNociception and pain sensation and modulation | **Hyperreflexia****Spinal muscular atrophy****Upper motor neuron lesions****Lower motor neuron lesions****Parkinson’s disease****Excitotoxicity****Pain** | Blackboard: Ganong; WashUNeuroIntroRhoades & Bell Ch 3, 5, 7 |
| 12 | 8/9 | **Test # 5** |