

RXRS 200: Approaches to Pharmacology and Drug Development

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Course Weight: 4 units

Days/Time/Location: Tuesday, Thursday: 12:30-1:50pm (Online via Zoom)

Catalogue description: Pharmacology and Drug Development explored through the lens of Clinical Pharmacy, Translational and Bench Research, and Regulatory Science.

Introduction

This introductory course in **Pharmacology and Drug Development** is designed to give students a sampling of the many facets of pharmacology, including drug discovery and development. It will also be of great interest to undergraduates seeking a basic understanding of the process of medication development as it spans from initial discovery to a final drug product. The material presented will give undergraduate students an introductory sampling of basic pharmacological principles and their application in the research and clinical settings.

In addition, the course will introduce to the students to basic principles of drug action and pharmacodynamics, differences in drug sensitivity across the population and how inappropriate drug use can lead to addiction. Finally, students will have the opportunity to see how these processes are currently being applied to the development of therapeutic agents for the COVID-19 public health crisis.

Objectives

Upon successful completion of this course, the student should be able to participate in a

thoughtful debate about the following topics:

- Describe and define the basic terms and concepts of pharmacology
- Explain the scientific principles of drug action and their pharmacological effect
- Explain the hallmarks of different drug classes and provide examples of specific drugs within each broad class
- Describe the biochemical reactions that result in drug metabolism
- Compare different patient populations and their relationships to drugs
- Describe and give examples of drug addiction as it relates to pharmacology
- Describe the regulatory workflow that new pharmaceuticals follow from discovery to market

Evaluation and Grading:

Evaluation will be based on class participation, quizzes, one midterm exam, one final exam, and one group presentation.

<i>Description</i>	<i>Points</i>	<i>Weight</i>
<i>Quizzes 3@ 10 pts each)</i>	30 pts	15%
<i>Group presentation</i>	40 pts	20%
<i>Discussion Board Participation</i>	20 pts	10%
<i>Midterm exam</i>	40 pts	20%
<i>Final Assignment (Submitted to Blackboard)</i>	70 pts	35%
Total	200 pts	100%

Attendance at all classes is expected. It is expected that the students read the assigned papers prior to the lecture, prepare for group presentations and be prepared to discuss the background, current understanding, treatments, and gaps in knowledge for the topic in each lecture.

15% Quizzes: There will be 3 quizzes over the course of the semester to count towards the overall grade. The quizzes will be based on questions from the lecture and content discussed in class. Quizzes will include multiple-choice, T/F, and fill-in-the-blank questions. Quizzes may also be in the form of in-class writing assignments to assess the comprehension of topics presented in class.

20% Midterm: There will be 1 midterm for this course that will cover the first 5 weeks of course material. The midterms will also include multiple-choice questions T/F questions fill-in-the-blank questions and possibly short answers. This midterm exam will help students to generate a critical assessment of critical topics in this course, to develop a suitable argument, and to convey their ideas and interpretations through the written word.

35% Final: The Final Exam will be a deliverable assignment submitted to the course instructor on Blackboard. Students will provide an overview of a pharmacologic agent to practice scientific writing, critical thinking, and apply knowledge of pharmacology through an essay composition. Students will research and share their findings to address topics ranging from pharmacology to current news related to the agent. Further information of the final exam will be released after the Midterm exam.

20% Group Presentation: Each student will participate in 1 of the 3 scheduled group presentations, approximately 15 minutes, and a 5 minutes Q&A at the beginning of selected class sessions. Students will be presenting in groups to discuss and share the content of peer-

review paper or current news events relevant to pharmacology, pharmaceutical sciences, or regulatory aspects. This will be 40 points contributed to the overall grade. For assignment Description and Grading Criteria, refer to the Group Presentation Assignment Description found on Blackboard under the Assignment tab.

10% Discussion Board Participation: Each student will participate in Discussion Board posts during the semester or other deliverable assignments on Blackboard. The points will be allocated below:

Assignment	Due Date	Points
Completing baseline assessment	08/20/2020 11:59 PM PST	5
Submitting at minimum 1 question for our panelists	09/15/2020 11:59 PM PST	5
Provide feedback to student presenters on the day that you are not presenting	TBA	10

Instructors may make arrangements with individual students to take the midterm and final examinations at times other than the regularly scheduled time if there are exceptional circumstances. It is up to the instructors to work in cooperation with students to schedule appropriate makeup final examination arrangements according to the makeup final examination scheduling policies.

Notes, books, calculators, electronic dictionaries, regular dictionaries, cell phones, or any other aids are not allowed during exams.

Students will be asked to complete an anonymous critical evaluation of the course at its completion.

Please note below is the “Approximate” grading scale breakdown. However, this scale is not set in stone and may slightly shift up or down based on overall scores.

Percent	Letter Grade
92-100%	A
90-91%	A-
88-89%	B+
82-87%	B
80-81%	B-
78-79%	C+
72-77%	C
70-71%	C-
60-69%	D
Below 60%	F

Class Policies Regarding Class Discussions and Etiquette

An overview of the class policies and how they relate to the discussions and interactions that will occur in this class can be found below. We expect each student to review, understand and adhere to these policies.

Respect

- Listen actively and attentively
- No name calling or other character attacks
- Always use a respectful tone
- Be aware of the fact that tone of voice and body language are powerful communicators. Some postures or facial expressions can silence, intimidate, or hurt your classmates (e.g. crossed arms, eye rolls). Other postures or facial expressions can show you are listening respectfully (e.g. making eye contact, staying quiet, nodding).

Constructiveness

- If you wish to challenge something that has been said, challenge the idea not the individual sharing it
- Ask for clarification if you are confused
- Commit to learning, not debating

Inclusivity

- Try not to silence yourself out of concern for what others will think about what you say
- Try not to let your question (or answer) run on. Give others the chance to speak, too.
- Do not remain silent. Make sure to contribute to the discussion
- Take responsibility for the quality of the discussion

Online learning Etiquette

- If it is not possible to have your webcam on during the entire class, do your best to have it on when speaking
- Turn off your microphone when not speaking
- If you need to step away from your computer during class (e.g. get a drink of water, use the bathroom, attend to a family member/pet) please do so quietly and without disturbing your classmates. Return to the class when you can.
- Be aware the contents of conversations typed into the chat box, even private conversations, are visible by the instructors

Course Readings

Textbook

Pharmacology: An Introduction, 7th Edition by Henry Hitner and Barbara Nagel. McGraw Hill

Short, selected chapters will be assigned to clarify and augment lecture materials.

Supplemental Readings

Supplemental readings are posted on the course website (<http://blackboard.usc.edu/>). These readings have been compiled from a variety of source materials to provide you with current evidence-based practices from the field of pharmacology and augment lecture materials.

Selected chapters from the textbook and supplemental readings should be read according to the course outline below; these materials are relevant for group presentations, quizzes, and exams.

Course Outline

This course will be in the format of a directed lecture under the guidance of the instructor for the specific session. During each biweekly session, the instructor will engage the students with questions and draw comments or interpretations primarily based on the assigned reading. Students are expected to ask questions and participate in an interactive fashion. Because this is an area of rapid change in policies, the readings may vary from one term to the next.

The course schedule is as follows:

Week	Date	Topic	Presenter	Supplemental Resources and Assignment
Week 1	08/18/2020	<ul style="list-style-type: none"> • Introduction: expectations and goals of this class. Practice BlackBoard features. • History of the Pharmaceutical Industry. 	T. Phan & A. Burkhardt	<p>Assignment (5 pts): Complete course baseline knowledge assessment. Submitted to Blackboard by 08/20/2020 11:59 PM PST</p> <p>What is Pharmacology:</p>
	08/20/2020	<ul style="list-style-type: none"> • Introductions to general concepts of pharmacology 	T. Phan	<p>Basics on Pharmacokinetics (PK) / pharmacodynamics (PD):</p> <p>A very brief overview of P.K. and P.D.:</p>
Week 2	08/25/2020	<ul style="list-style-type: none"> • Principles of Drug Action and Pharmacodynamics 	T. Phan	Hitner and Nagel – Chapter 3-4
	08/27/2020	<ul style="list-style-type: none"> • Molecular and Cellular Mechanisms: An introduction to signaling • What is a first vs second messenger? • What is a response? 	T. Phan	
Week 3	09/01/2020	<ul style="list-style-type: none"> • Principles of Pharmacokinetics 	T. Phan	Hintner and Nagel – Chapter 5-8
	09/03/2020	<ul style="list-style-type: none"> • Presentations & Online Research 	A. Burkhardt	
Week 4	09/08/2020	<ul style="list-style-type: none"> • Introduction to Physiology and Systems of the Body and their correlation to PD/PK. 	T. Phan	
	09/10/2020	<ul style="list-style-type: none"> • Quiz 1 • Student Presentation 	Students	Discussion Board Assignment (5 pts): Submit 1 question for our panelists and provide feedback the

				presenting groups by 9-15-2020 on Discussion board.
Week 5	09/15/2020	<ul style="list-style-type: none"> • Introduction to Personalized Medicine and Pharmacogenomics 	T. Phan	
	09/17/2020	<ul style="list-style-type: none"> • Seminar/ Panel: Pathways and Career Opportunities in PDD 	Phan, Burkhardt, Davies, Church	
Week 6	09/22/2020	<ul style="list-style-type: none"> • MIDTERM EXAM 	Students	
	09/24/2020	<ul style="list-style-type: none"> • Systems Pharmacology: Psychotropics. 	T. Phan	
Week 7	09/29/2020	<ul style="list-style-type: none"> • Pharmacology of Drug Addiction: Tolerance, Dependence, Abuse, Addiction 	D. Davies	
	10/01/2020	<ul style="list-style-type: none"> • Pharmacology of Drug Addiction: Tolerance, Dependence, Abuse, Addiction 	D. Davies	
Week 8	10/06/2020	<ul style="list-style-type: none"> • Practical aspects of drug discoveries. 	D. Davies	
	10/08/2020	<ul style="list-style-type: none"> • Drug Discovery (candidate to animal models) 	T. Church	
Week 9	10/13/2020	<ul style="list-style-type: none"> • How drugs come to market (roles of FDA, USDA, EPA to ensure safety, clinical trials) 	T. Church	
	10/15/2020	<ul style="list-style-type: none"> • Regulation: Prescription Medication vs OTC vs Nutraceuticals (DSHEA) 	T. Church	
Week 10	10/20/2020	<ul style="list-style-type: none"> • Era of COVID: Introduction to Infectious Disease 	A. Burkhardt	
	10/22/2020	<ul style="list-style-type: none"> • Quiz 2 • Student Presentation 	Students	Discussion Board Assignment (5 pts): Submit your feedback for the presenting groups by 10/22 11:59PM
Week 11	10/27/2020	<ul style="list-style-type: none"> • Era of COVID: Introduction to Immunology and immune response. 	A. Burkhardt	
	10/29/2020	<ul style="list-style-type: none"> • Traditional Drug Repurposed for COVID-19 : Hydroxychloroquine, Azithromycin, Ivermectins, 	T. Phan	

		Remdesivir? Will they be used?		
Week 12	11/03/2020	<ul style="list-style-type: none"> Principles of Vaccines/Vaccine development 	A. Burkhardt	
	11/05/2020	<ul style="list-style-type: none"> Changes to regulatory practices during COVID-19 	A. Burkhardt	
Week 13	11/10/2020	<ul style="list-style-type: none"> Quiz 3 Student Presentation 	Students	Discussion Board Assignment (5 pts): Submit your feedback for the presenting groups by 11/10 11:59PM
	11/12/2020	<ul style="list-style-type: none"> Review session + QA 	T. Phan & A. Burkhardt	
Finals Week	Submit your Final Exam to Blackboard Due Date: TBA			

Statement on Academic Conduct and Support Systems

Academic Dishonesty

Academic dishonesty undermines the hard work of all students in the class who take responsibility for their learning. We encourage you to speak with the instructors if you learn of any incidents of academic dishonesty. Academic dishonesty includes, but is not limited to, cheating off another student during an exam, knowingly allowing another student to copy off your exam, misrepresentation or bribing someone for an academic advantage.

Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

This serves as your official notification of these policies and our expectation that you will adhere to them. Commit academic dishonesty at your own risk. Do work that you will be proud of and stand by your performance.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.
engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on-call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes, and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24- hour