

## RXRS 200: Approaches to Pharmacology and Drug Development

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**Course Weight:** 4 units

**Days/Time:** Tuesday, Thursday: 12:30-1:50pm

**Location:** WPH B27

**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
- Develop therapeutic treatment plans to manage and treat complex disease states
- Evaluate the pharmacology of known therapeutics for their efficacy in treating or managing disease

## Evaluation and Grading:

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

<b>Description</b>	<b>Points</b>	<b>Weight</b>
<i>Quizzes 3@ 15 pts each, drop one)</i>	30 pts	15%
<i>Therapeutics Battle</i>	50 pts	25%
<i>Discussion Board Participation</i>	10 pts	5%
<i>Midterm exam</i>	40 pts	20%
<i>Final Exam</i>	70 pts	35%
<b>Total</b>	<b>200 pts</b>	<b>100%</b>

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. Quizzes will be administered at the beginning of the lecture on schedule days. Students will be able to drop one quiz and the two quizzes with the highest grades will 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 7 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 (70 points) will include multiple choice and T/F questions as well as a series of questions involving short answers. The final exam will be cumulative but will emphasize material covered after the 2nd midterm.

**25% Therapeutics Battle:** See Assignment Description on Blackboard for full details about this activity. All students will participate in this activity each week it is offered.

**5% 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	08/26/2021 11:59 PM PST	5
Submitting minimum 1 panelist question	09/16/2021 11:59 PM PST	5

**There are no make-up exams.** If exceptional circumstances prevent you from attending an exam, your reason for missing it must be accompanied by a written statement from a third party (e.g., a note from a medical doctor).

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 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

### **Course Readings**

#### ***Textbook***

*Pharmacology: An Introduction, 7<sup>th</sup> Edition* by Henry Hitner and Barbara Nagel. McGraw Hill

The textbook is not required, but short, selected supplemental chapters will be listed in the syllabus to clarify and augment lecture materials.

#### ***Supplemental Readings***

Supplemental readings will be 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. These materials are relevant for 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 for the first 9 weeks, and then a mixture of lecture and student-led activities for the remainder of the semester. During each biweekly session, the instructor will engage the students with questions and ask for interpretations to be drawn from the presented lecture or activity materials. Students are expected to ask questions and participate in an interactive fashion. As this is an area of rapid change in policies, the readings may vary from one term to the next. The course schedule is subject to change, but tentatively will follow the schedule below.

Week	Date	Topic	Presenter	Supplemental Resources and Assignments
Week 1	08/24/2021	<ul style="list-style-type: none"> <li>• Introduction: expectations and goals of this class. Practice Blackboard features.</li> <li>• Assignment orientation</li> </ul>	T. Phan + A. Burkhardt	<p><b>Assignment (5 pts):</b> Complete course baseline knowledge assessment. Submitted to Blackboard by 08/26/2021 11:59 PM PST</p> <p><a href="#">What is Pharmacology:</a></p>
Week 1	08/26/2021	<ul style="list-style-type: none"> <li>• History of the Pharmaceutical Industry</li> <li>• Introductions to general concepts of pharmacology</li> </ul>	T. Phan	<p><a href="#">Basics on Pharmacokinetics (PK) / pharmacodynamics (PD):</a></p> <p><a href="#">A very brief overview of P.K. and P.D.:</a></p>
Week 2	08/31/2021	<ul style="list-style-type: none"> <li>• Principles of Pharmacokinetics</li> <li>• Introduction to Physiology and Systems of the Body and their correlation to PD/PK</li> </ul>	T. Phan	Hitner and Nagel – Chapter 3-4
	09/02/2021	<ul style="list-style-type: none"> <li>• Introduction to Personalized Medicine and Pharmacogenomics</li> </ul>	T. Phan	
Week 3	09/07/2021	<ul style="list-style-type: none"> <li>• Principles of Drug Action and Pharmacodynamics</li> </ul>	M. Mathews	Hintner and Nagel – Chapter 5-8
	09/09/2021	<ul style="list-style-type: none"> <li>• Systems Pharmacology: Psychotropic.</li> </ul>	T. Phan	QUIZ 1 (up to week 2)
Week 4	09/14/2021	<ul style="list-style-type: none"> <li>• Drug Discovery (candidate to animal models)</li> </ul>	T. Church	
	09/16/2021	<ul style="list-style-type: none"> <li>• How drugs come to market (roles of FDA, USDA, EPA to ensure safety, clinical trials)</li> </ul>	T. Church	
Week 5	09/21/2021	<ul style="list-style-type: none"> <li>• Practical aspects of drug discovery</li> </ul>	D. Davies	
	09/23/2021	<ul style="list-style-type: none"> <li>• Vaccines</li> </ul>	A. Burkhardt	
Week 6	09/28/2021	<ul style="list-style-type: none"> <li>• Biologics</li> </ul>	A. Burkhardt/H. Gukasyan	
	09/30/2021	<ul style="list-style-type: none"> <li>• Pharmacoeconomics</li> </ul>	E. Tish	
Week 7	10/05/2021	<ul style="list-style-type: none"> <li>• Pharmacy Practice Overview</li> </ul>	W. Fakolade	<p><b>Discussion Board Assignment (5 pts):</b> Submit 1 question for our panelists by 9-16-2021 on Blackboard.</p>

	10/07/2021	<ul style="list-style-type: none"> <li>• Seminar/ Panel: Pathways and Career Opportunities in Pharmacy and Drug Development</li> </ul>	Phan, Burkhardt, Davies, Church, Gukasyan, Resident(?)	
Week 8	10/12/2021	<ul style="list-style-type: none"> <li>• <b>MIDTERM EXAM</b></li> </ul>	<b>Students</b>	
Week 8	10/14/2021	<b>FALL RECESS – No Class</b>		
Week 9	10/19/2021	<ul style="list-style-type: none"> <li>• Diabetes</li> </ul>	A. Burkhardt	
Week 9	10/21/2021	<ul style="list-style-type: none"> <li>• Activity</li> </ul>		
Week 10	10/26/2021	<ul style="list-style-type: none"> <li>• Cardiovascular disease</li> </ul>	A. Burkhardt	
Week 10	10/28/2021	<ul style="list-style-type: none"> <li>• Activity</li> </ul>		
Week 11	11/02/2021	<ul style="list-style-type: none"> <li>• Insomnia</li> </ul>	T. Phan	<b>QUIZ 2</b>
Week 11	11/04/2021	<ul style="list-style-type: none"> <li>• Activity</li> </ul>		
Week 12	11/09/2021	<ul style="list-style-type: none"> <li>• Mood (depression/anxiety)</li> </ul>	T. Phan	
Week 12	11/11/2021	<ul style="list-style-type: none"> <li>• Activity</li> </ul>		
Week 13	11/16/2021	<ul style="list-style-type: none"> <li>• Immune Health</li> </ul>	A. Burkhardt	<b>QUIZ 3</b>
Week 13	11/18/2021	<ul style="list-style-type: none"> <li>• Activity</li> </ul>		
Week 14	11/23/2021	<ul style="list-style-type: none"> <li>• HIV</li> </ul>	T. Phan	
Week 14	11/25/2021	<b>THANKSGIVING BREAK – No Class</b>		
Week 15	11/30/2021	<ul style="list-style-type: none"> <li>• Cancer</li> </ul>	A. Burkhardt	
Week 15	12/02/2021	<ul style="list-style-type: none"> <li>• Review session</li> </ul>	T. Phan & A. Burkhardt	
Finals Week	<b>FINAL EXAM</b> <b>Tuesday, December 14 - 11 AM to 1 PM</b>			

## Statement on Academic Conduct and Support Systems

### Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. 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](http://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, [policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).

### Support Systems:

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*

[studenthealth.usc.edu/counseling](http://studenthealth.usc.edu/counseling)

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

*National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call*

[suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call*

[studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

*Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298*

[equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*

[usc-advocate.symplicity.com/care\\_report](http://usc-advocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

*The Office of Disability Services and Programs - (213) 740-0776*

[dsp.usc.edu](http://dsp.usc.edu)

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

*USC Campus Support and Intervention - (213) 821-4710*

[campussupport.usc.edu](http://campussupport.usc.edu)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

*Diversity at USC - (213) 740-2101*

[diversity.usc.edu](http://diversity.usc.edu)

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

*USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu), [emergency.usc.edu](http://emergency.usc.edu)

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

*USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu)

Non-emergency assistance or information.

## Supplement: Blackboard

### Blackboard

[Blackboard](#) is the University's Learning Management System (LMS) used by instructors across campus to distribute course materials, communicate with students in discussion boards, and to collect and assess student work through assignments, quizzes, and tests. A Blackboard course is created for every course at USC and should be the primary tool used for classroom management and communication.

Visit <https://blackboardhelp.usc.edu> to learn more about the various functions of Blackboard.