

# USC Mann

Alfred E. Mann School of Pharmacy  
and Pharmaceutical Sciences

## RXRS 200: Approaches to Pharmacology and Drug Development

### Instructors:

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**Course Weight:** 4 units

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

**Location:** MHP101

**Office Hours:** Check Blackboard for each instructor's office hour availability. If you are unable to attend the scheduled office hours, contact the instructor(s) directly to schedule an appointment to meet with them.

**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

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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@ 10 pts each)</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>

In person 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

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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. See the course outline for what material will be tested on each quiz.

**20% Midterm Exam:** 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 Exam:** The final exam 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 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. If students are unable to participate in a Therapeutics Battle an alternative assignment is available (see Assignment Description on Blackboard). The materials for the Therapeutics Battles and the Alternative Assignment must be submitted to Blackboard before the start of the next class meeting (i.e. the following Tuesday at 12:30p PDT/PST) to be eligible for full credit.

**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	08/24/2023 11:59 PM PDT	5
Submitting at minimum 1 question for our panelists	09/21/2023 11:59 PM PDT	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 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.

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- 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

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 subject to change, but tentatively will follow the schedule below.

Week	Date	Topic	Presenter	Reading and Supplemental Resources
Week 1	8/22/23	<ul style="list-style-type: none"><li>• Introduction: expectations and goals of this class</li><li>• Assignment orientation</li><li>• <b>Assignment (5 pts):</b> Complete course baseline knowledge assessment. Submitted to Blackboard by 08/24/2023 11:59 PM PDT</li></ul>	T. Phan + A. Burkhardt + H. Gukasyan	<u>What is Pharmacology:</u>
Week 1	8/24/23	<ul style="list-style-type: none"><li>• History of the Pharmaceutical Industry</li></ul>	H. Gukasyan	<u>Basics on Pharmacokinetics (PK)</u> / 5

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		<ul style="list-style-type: none"> <li>• Introductions to general concepts of pharmacology</li> <li>• <b>Deadline to complete Baseline Assessment on Blackboard 11:59 PM PDT</b></li> </ul>		<u>pharmacodynamics (PD):</u>  <u>A very brief overview of P.K. and P.D.:</u>
Week 2	8/29/23	<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>	H. Gukasyan	Hitner and Nagel – Chapter 3-4
	8/31/23	<ul style="list-style-type: none"> <li>• Principles of Drug Action and Pharmacodynamics</li> </ul>	H. Gukasyan	Hitner and Nagel – Chapter 5-8
Week 3	9/5/23	<ul style="list-style-type: none"> <li>• Drug Discovery (candidate to animal models)</li> </ul>	H. Gukasyan	
	9/7/23	<ul style="list-style-type: none"> <li>• <b>Quiz 1 – End of week 2 (Asynchronously on Blackboard)</b></li> <li>• How drugs come to market (roles of FDA, USDA, EPA to ensure safety, clinical trials)</li> </ul>	H. Gukasyan	
Week 4	9/12/23	<ul style="list-style-type: none"> <li>• Clinical Pharmacy Practice</li> <li>•</li> </ul>	Resident/T. Phan	
	9/14/23	<ul style="list-style-type: none"> <li>• Pharmacology and Regulatory Science</li> <li>• Regulations of Pharmaceutics</li> </ul>	T. Church	
Week 5	9/19/23	<ul style="list-style-type: none"> <li>• Pharmacoeconomics</li> </ul>	E. Trish	
	9/21/23	<ul style="list-style-type: none"> <li>• Biologics</li> <li>• <b>Discussion Board Assignment (5 pts):</b> Submit 1 question for our panelists on Discussion board by 9/21/23 at 11:59 PM PDT</li> </ul>	H. Gukasyan	
Week 6	9/26/23	<ul style="list-style-type: none"> <li>• Vaccines</li> </ul>	A. Burkhardt	

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	9/28/23	<ul style="list-style-type: none"> <li>Pharmacogenomics and Personalized Medicine</li> </ul>	Resident/T. Phan	
Week 7	10/3/23	<ul style="list-style-type: none"> <li>Practical aspects of drug discoveries.</li> </ul>	D. Davies	
	10/5/23	<ul style="list-style-type: none"> <li>Seminar/ Panel: Pathways and Career Opportunities in PDD</li> </ul>	Phan, Burkhardt, Davies, Church, H. Gukasyan, E. Trish, Resident	
Week 8	10/10/23	<ul style="list-style-type: none"> <li><b>MIDTERM EXAM</b> End of Week 7</li> </ul>	Students	
Week 8	10/12/23	Fall Recess		
Week 9	10/17/23	<ul style="list-style-type: none"> <li>Disease state 1: Insomnia</li> </ul>	T. Phan	
Week 9	10/19/23	<ul style="list-style-type: none"> <li>Activity</li> </ul>		
Week 10	10/24/23	<ul style="list-style-type: none"> <li>Disease state 2: Mood (depression/anxiety)</li> </ul>	T. Phan	
Week 10	10/26/23	<ul style="list-style-type: none"> <li>Activity</li> </ul>		
Week 11	10/31/23	<ul style="list-style-type: none"> <li><b>Quiz 2 (End of Week 10 Asynchronously on Blackboard)</b></li> <li>Disease state 3: Diabetes</li> </ul>	A. Burkhardt	
Week 11	11/2/23	<ul style="list-style-type: none"> <li>Activity</li> </ul>		
Week 12	11/7/23	<ul style="list-style-type: none"> <li>Disease state 4: Heart disease</li> </ul>	A. Burkhardt	
Week 12	11/9/23	<ul style="list-style-type: none"> <li>Activity</li> </ul>		
Week 13	11/14/23	<ul style="list-style-type: none"> <li><b>Quiz 3 (End of Week 12 Asynchronously on Blackboard)</b></li> <li>Disease state 5: Immune health</li> </ul>	A. Burkhardt	
Week 13	11/16/23	<ul style="list-style-type: none"> <li>Activity</li> </ul>		
Week 14	11/21/23	<ul style="list-style-type: none"> <li>Complex therapeutics: HIV Overview</li> </ul>	T. Phan	

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Week 14	11/23/23	Thanksgiving Break		
Week 15	11/28/23	<ul style="list-style-type: none"><li>Complex therapeutics: Cancer Overview</li></ul>	A. Burkhardt	
Week 15	11/30/23	<ul style="list-style-type: none"><li>Review session + QA</li></ul>	T. Phan & A. Burkhardt	
Finals Week	<b>Final Exam</b>			



## Course Content Distribution and Synchronous Session Recordings Policies

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USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment. Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

### Academic Integrity:

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

## Statement on Academic Conduct and Support Systems

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### Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

### Students and Disability Accommodations:

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USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](https://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

## **Support Systems:**

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

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

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

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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

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

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

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

[Diversity, Equity and Inclusion](#) - (213) 740-2101

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

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) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

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## Supplement: Zoom and Blackboard

### Zoom

[Zoom](#) is a videoconferencing application that enables audio and video conferencing between multiple users on both desktop computers and mobile devices. It can allow faculty to host class lectures, discussions, share screens and files, and chat with students using a PC, tablet, or even a cell phone equipped with a camera. Zoom is available to all faculty and students at no cost.

- Instructors may host live class sessions on Zoom at the same day and time as their regular class.
- Instructors are required to [record all Zoom lectures](#) and discussions for ADA (Americans with Disabilities Act) compliance, but also to accommodate students who may not be able to keep to the original class schedule.

Links to the recordings of lectures will be posted and organized in Blackboard as soon as they are available.

#### 1. Getting Started with Zoom:

- You might be required to use Zoom in this course, please familiarize yourself with it by thoroughly reading all of the materials and [the step-by-step instructions](#).

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- You will access the Zoom meeting space in one of two ways:
  1. Log in via blackboard after you have followed the instructions to initially download, install, and login. Then enter the meeting by going to the link **USC Zoom Meetings** in the left-hand navigation pane. You will need to click the “Join” button next to the classroom for the time set for the meeting.
  2. Copy and paste the URL (or click on the web link) provided by your instructor at the time specified for the meeting. Launch the app (after initially downloading, installing, and logging in), and you will enter the meeting immediately.
- You may choose to use Zoom on your mobile device (phone or tablet).
- 2. Things to Know About Zoom:
  - Because you sign in using your USC information, you have your own profile in Zoom.
  - Attendance and participation can be tracked using your USC profile.
  - You can find the privacy and accessibility policies for Zoom by clicking on the Learner Support tab in the left-hand navigation pane of your Blackboard course.

## 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.