

**Principles of Drug Action II  
PHRD 4027**

**I. Contact Information**

**Course Coordinators:**

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**\*Preferred Method of Contact**

**II. Course Pre-requisites/Co-requisites**

Pre-requisites: PHRD 4002

**III. Course Description**

Principles of Drug Action II (2 Cr): This course continues from PHRD 4002 with a focus on the molecular-level composition of living organisms in relationship to the biochemical and molecular biopharmaceutical bases of therapeutic intervention with medicinal substances, the actions of these substances (beneficial and harmful), and, accordingly, the associated foundational concepts of molecular pharmacology and toxicology.

## IV. Curricular Objectives and Outcomes

### CAPE

#### Domain 1 – Foundational Knowledge

1.1. Learner (Learner) - Develop, integrate, and apply knowledge from the foundational sciences (i.e., pharmaceutical, social/behavioral/administrative, and clinical sciences) to evaluate the scientific literature, explain drug action, solve therapeutic problems, and advance population health and patient-centered care.

#### Domain 2 – Essentials for Practice and Care

2.1. Patient-centered care (Caregiver) - Provide patient-centered care as the medication expert (collect and interpret evidence, prioritize, formulate assessments and recommendations, implement, monitor and adjust plans, and document activities).

2.3. Health and wellness (Promoter) - Design prevention, intervention, and educational strategies for individuals and communities to manage chronic disease and improve health and wellness.

2.4. Population-based care (Provider) - Describe how population-based care influences patient-centered care and influences the development of practice guidelines and evidence-based best practices.

#### Domain 3 - Approach to Practice and Care

3.1. Problem Solving (Problem Solver) – Identify problems; explore and prioritize potential strategies; and design, implement, and evaluate a viable solution.

3.2. Educator (Educator) – Educate all audiences by determining the most effective and enduring ways to impart information and assess understanding.

3.3. Patient Advocacy (Advocate) - Assure that patients' best interests are represented.

3.5. Cultural sensitivity (Includer) - Recognize social determinants of health to diminish disparities and inequities in access to quality care.

3.6. Communication (Communicator) – Effectively communicate verbally and nonverbally when interacting with an individual, group, or organization.

#### Domain 4 – Personal and Professional Development

4.1. Self-awareness (Self-aware) – Examine and reflect on personal knowledge, skills, abilities, beliefs, biases, motivation, and emotions that could enhance or limit personal and professional growth.

4.4. Professionalism (Professional) - Exhibit behaviors and values that are consistent with the trust given to the profession by patients, other healthcare providers, and society.

### ACPE APPENDIX 1

**Biochemistry:** Structure, properties, biological functions, applicable kinetics, and metabolic fate of macromolecules essential to life (proteins, lipids, carbohydrates, and nucleic acids). Application of these concepts to identify endogenous targets for drug therapy and rational drug design strategies. **Human Physiology:** Homeostatic function and normal response reactions across the lifespan of non-diseased human cells, organs, and systems.

**Pathology/Pathophysiology:** Basic principles, mechanisms, functional changes and metabolic sequelae of human disease impacting cells, organs, and systems.

**Clinical Chemistry:** Application of clinical laboratory data to disease state management, including screening, diagnosis, progression, and treatment evaluation.

**Medicinal Chemistry:** Chemical basis of drug action and behavior in vivo and in vitro, with an emphasis on pharmacophore recognition and the application of physicochemical properties, structure-activity relationships, intermolecular drug-receptor interactions and metabolism to therapeutic decision-making.

**Pharmacology:** Pharmacodynamics, mechanisms of therapeutic and adverse drug actions and interactions, lifespan-dependent variations in physiology or biochemistry that impact drug action and effectiveness, and application of these principles to therapeutic decision-making.

**Pharmacoepidemiology:** Cause-and-effect patterns of health and disease in large populations that advance safe and effective drug use and positive care outcomes within those populations.

**Clinical Pharmacokinetics:** Application of basic pharmacokinetic principles and mathematical models to calculate safe and effective doses of drugs for individual patients, and adjust therapy as appropriate through the monitoring of drug concentration in biological fluids.

**Patient Assessment:** Evaluation of patient function and dysfunction through the performance of tests and assessments leading to objective (e.g., physical assessment, health screening, and lab data interpretation) and subjective (patient interview) data important to the provision of care.

**Pharmacotherapy:** Evidence-based clinical decision making, therapeutic treatment planning, and medication therapy management strategy development for patients with specific diseases and conditions that complicate care and/or put patients at high risk for adverse events. Emphasis on patient safety, clinical efficacy, pharmacogenomic and pharmacoeconomic considerations, and treatment of patients across the lifespan.

## V. Course Specific Objectives and Outcomes

- To introduce students to basic concepts of molecular pharmacology, pharmacodynamics, pharmacokinetics, receptor activation and signal transduction, biologics and clinical toxicology.
- Students should be able to predict physiological reactions to various pharmacological therapies and challenges at the cellular and molecular level.
- Students should be able to utilize information to explain the cellular and molecular mechanism of action of drugs when given in either therapeutic or toxic doses.

## VI. Course Topics

Receptor pharmacology, activation, second messenger signal transduction, regulation and responsiveness. Drug and drug target pharmacodynamics in relation to potency, affinity, efficacy, toxicology, and additive/antagonists/synergism. Introduction to pharmacokinetics, epigenetics, biologics and clinical toxicology.

## VII. Instructional Methods and Activities

Traditional lecture format. Lecture notes will be posted online prior to each class. Students should review notes and all assigned reading prior to each class. Additional instructional methods may also include in-class discussion of novel pharmacological and therapeutic interventions, small group discussions, problem-based learning, case-based learning, and individual projects or assignments.

## VIII. Evaluation and Grade Assignment

- a. There will be 3 midterm exams (100 points per exam) and a final exam (100 points) for a total of 400 points. The final exam will not be comprehensive.
- b. Exam dates are scheduled in the course syllabus and will only be changed as per College of Pharmacy policy or in the event of University closure.
- c. Exams may be multiple choice, fill in the blank, short-answer, case or scenario based discussion, essay, or any other format deemed necessary by the lecturers and course coordinators.
- d. Normal laboratory values will be provided for all questions, unless otherwise specified during class.
- e. Lab values that are specific to a particular disease state will not be provided.
- f. Information acquired from previous lectures in the course and from other courses in the professional pharmacy curriculum may be needed in preparing for these examinations.
- g. Exams will cover material (readings, outside assignments) not covered in class.
- h. Exams will NOT be returned to the student. Review sessions may be scheduled for students to review the exam with the test question writer. Also, the test question writer may post an exam key and/or explanation of correct answers to Moodle. Format for review of test questions are to be determined by the test question writer and completed within 2 weeks of the exam date.
- i. Use of programmable calculators will not be allowed during quizzes or exams.

j. Students wishing to review their exams with the course coordinator or with a specific lecturer must do so *within 2 weeks* of when the test scores are posted.

k. Students wishing to challenge a question on the test must provide the course coordinator with a written statement that identifies which question(s) being challenged, why the student feels his or her answer(s) is/are correct and references from recent (published within the last 1-2 years) primary or tertiary literature to support the claim. Problems or issues with question(s) should be first directed, via e-mail, to the faculty member who presented the material. The course coordinator should be copied on this communication. In the event that the faculty member and the student cannot arrive at an acceptable conclusion, the course coordinator should be contacted regarding the issue. Discussion of a dispute will occur only after a written query is submitted. Challenges of test questions will only be considered *within 2 weeks* of when the test scores are posted.

l. In the event that a determination is made that there is a legitimate issue with a particular test question, adjustments to scores will be made based on discussions between the test question writer and the course coordinator.

m. Professional student mid-term grades will be posted on-line for students to view via Banner. Mid-term grades indicate a student's status at mid-semester only and do not indicate the final performance outcome of a student.

n. "Students scoring <70% on any exam and an overall exam average <70% (excludes quizzes, assignments, bonus, etc.) will be required to submit to the coordinator written, narrative responses to select lecture objectives that will be provided within 48 hours of the posting of their exam grade to Moodle. These objectives will be in the form of a Moodle assignment and represent unit--- or lecture---level objectives to be tested upon in the next scheduled course exam. Written responses must be submitted no later than one calendar week before the next scheduled exam. Responses must be written in complete sentences and may not be copied or pasted from any source, including class notes, treatment guidelines, textbooks, or any internet site. Submissions found to contain responses that have not been written in a student's own words will be considered a failure to submit.

In addition, students will be required to review each failed exam's ExamSoft---generated missed item report with the course coordinator or instructor responsible for each section of material. The discussion should include the student's reasoning for the incorrect answer as well as the reason for the correct answer.

In addition to answering objectives as described above and reviewing missed item reports, first professional year students scoring <70% on any exam and having an overall exam average <70% (excludes quizzes, assignments, bonus, etc.) will meet with the Director of Professional Affairs.

Failure to submit this required assignment will result in ineligibility to remediate.

#### **Grading Scale:**

89.5 – 100%	A
79.5 – 89.4%	B
69.5 – 79.4%	C
59.5 – 69.4%	D
≤ 59.4%	F

**Student Success Policy:** <http://www.ulm.edu/pharmacy/documents/ospa/earlyintervention.pdf>

**Remediation Policy:** <http://www.ulm.edu/pharmacy/documents/ospa/remediationpolicy.pdf>

## **IX. Class Policies and Procedures**

At a minimum, all policies stated in the current ULM *Student Policy Manual & Organizational Handbook* should be followed (see <http://www.ulm.edu/studentpolicy/>). Additional class policies include:

### **a. Textbooks (required): Obtained online in ULM College of Pharmacy Library Resources TOOLBOX, online textbooks, LWW Health Library, and AccessPharmacy**

1. David E. Golan, Ehrin J. Armstrong, April W. Armstrong, eds. *Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy, 4th edition.* Wolters Kluwer Health/Lippincott Williams & Wilkins 2017. ISBN 9781451191004.
2. Laurence Brunton, Bruce Chabner and Bjorn Knollman. *Goodman & Gilman's The Pharmacological Basis of Therapeutics, 13<sup>th</sup> edition.* McGraw-Hill 2018. ISBN 978-1-25-9584730-2.

3. *Robert S. Hoffman, Mary Ann Howland, Neal A. Lewin, Lewis S. Nelson, Lewis R. Goldfrank, eds. Goldfrank's Toxicologic Emergencies, 11<sup>th</sup> edition. McGraw-Hill Education 2019. ISBN 978-1259859618.*
4. *Additional REQUIRED reading materials may be posted on Moodle or provided by course faculty, if supplemental material is needed.*

- b. **Attendance Policy:** Class attendance is regarded as an obligation as well as a privilege, and students are expected to know attendance regulations and to attend regularly and punctually at classes in which they are enrolled. Failure to do so may: (1) prevent access to the classroom during regularly scheduled times; (2) jeopardize a student's scholastic standing; and (3) lead to suspension from the School or University. Students must submit excuses for class absences to course coordinators within three class days after returning to classes.

Professors shall accept an official University excuse. With the following exceptions, professors are to determine whether absences are excused or unexcused: 1) Absences arising from authorized trips away from the University or from special duties at the University shall be excused. 2) Absences arising from a student's confinement in a hospital or other in-patient facility or doctor's excused absences shall be excused. Students are responsible for verifying providing documentation to the faculty, which will be verified. 3) Absences arising from a death in the immediate family shall be excused. The immediate family is defined as spouse, child, step-child, mother, father, sister, brother, grandmother, grandfather, step-mother, step-father, step-brother, step-sister, aunt, uncle, mother-in-law or father-in-law.

- c. **Make-up Policy:** Each student is expected to attend each exam at the date and time specified. If a student cannot attend an exam due to valid University excuse, he/she must speak directly with the course coordinator, as soon as possible. The course coordinator must be notified **prior** to an examination if a student misses an exam. The ULM SOP Excused Absence Policy must be followed. Please refer to the official document for details. In case of emergency, the course coordinator must be notified within 48 hours of the emergency. Failure to do so will result in a zero (0) grade for that exam. Make-up exams will be prepared at the same or higher level than the original exam. The format of the make-up exam may be written or oral. Failure to attend a scheduled make-up exam will result in a zero (0) grade for that exam.

Students missing an exam due to a University approved excuse will take the make-up exam during the week of finals, or as determined by the course coordinator.

<http://www.ulm.edu/pharmacy/documents/ospa/excusedabsence.pdf>

- d. **Academic Integrity:** Faculty and students must observe the ULM published policy on Academic Dishonesty (see Page 4 of the ULM *Student Policy Manual* - <http://www.ulm.edu/studentpolicy/>). All professional students will adhere to the standards set forth in the School of Pharmacy's Code of Conduct

<http://www.ulm.edu/pharmacy/documents/ospa/codeofconductv82011.pdf>

#### Censures (Penalties)

Academic dishonesty will result in a referral to the Committee on Ethical and Professional Standards with a recommendation for a grade of "F" for the course and expulsion from the School of Pharmacy. Academic dishonesty includes, but is not limited to, the use of information taken from others' work or ideas, the provision of help to others on non-collaborative evaluations (tests, quizzes, etc.), collaboration on take home exams, or the use of unapproved information or electronic devices to assist in obtaining an answer to the question

- e. **Course Evaluation Policy:** At a minimum, students are expected to complete the online course evaluation.
- f. **Student Services:** Information concerning student services in the School of Pharmacy can be found in the School of Pharmacy Student Handbook. In particular, students should pay special attention to the University's technical standards and policies concerning students with special needs (<http://www.ulm.edu/studentpolicy/studentpolicy.pdf>). ULM student services, such as the Student Success Center (<http://ulm.edu/cass/>), Counseling Center (<http://ulm.edu/counselingcenter/>), and Student Health Services, is available at the following Student Services web site <http://ulm.edu/studentaffairs/>. Students with special needs requiring accommodations MUST follow the process described at <http://rxweb.ulm.edu/pharmacy/student/specialneeds.pdf>.

#### Mental Wellness on the ULM Campus

If you are having problems with emotional, social, and/or behavioral issues please call any of the mental health clinics on the ULM campus to make an appointment. All services are free to ULM students, staff, and faculty, and are strictly confidential.

- COP Office of Student and Professional Affairs: 342-3800
- ULM Counseling Center: 342-5220
- Marriage and Family Therapy Clinic: 342-5678
- Community Counseling Center: 342-1263
- ULM HELPS (Helping Educators and Learners Prevent Suicide) Project Office: 342-1335

The University of Louisiana at Monroe strives to serve students with special needs through compliance with Sections 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. These laws mandate that postsecondary institutions provide equal access to programs and services for students with disabilities without creating changes to the essential elements of the curriculum. While students with special needs are expected to meet our institution's academic standards, they are given the opportunity to fulfill learner outcomes in alternative ways. Examples of accommodations may include, but are not limited to, testing accommodations (oral testing, extended time for exams), interpreters, relocation of inaccessible classrooms, permission to audiotape lectures, note-taking assistance, and course substitutions.

*Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds, including federal loans and grants. Furthermore, Title IX prohibits sex discrimination to include sexual misconduct, sexual violence, sexual harassment and retaliation. If you encounter unlawful sexual harassment or gender-based discrimination, please contact Student Services at 318-342-5230 or to file a complaint, visit [www.ulm.edu/titleix](http://www.ulm.edu/titleix).*

- g. **Emergency Procedures:** Please review the emergency escape plan in the classrooms and hallways of the Bienville building. Move quickly and in an orderly manner to the appropriate stairwell and exit the building. The meeting place for this class will be the far end of the north parking lot between the Bienville building and Broadmoor Blvd. Under no circumstances is the elevator to be used for emergency evacuation. Any student needing assistance should notify the professor immediately. For emergencies, to contact University Police, call 1-911 from landlines and **342-5350 from cell phones**.
- h. Federal Regulations require determination and verification of every students' physical location while enrolled in classes (where they are physically located while taking classes), regardless of the delivery method (on campus, online). At the beginning of every semester and whenever physical location changes, students must update or verify their current location through banner

[https://ssb-prod.ec.ulm.edu/PROD/bwgkogad.P\\_SelectAtypUpdate](https://ssb-prod.ec.ulm.edu/PROD/bwgkogad.P_SelectAtypUpdate). Students should do this by the end of the first week of classes.

- i. This course may be/is a major requirement for the Doctor degree in Pharmacy. Completion of degree requirements leads to eligibility for professional licensure and/or certification in Louisiana upon graduation. Federal Regulations require universities to provide information to students about the alignment between Louisiana's requirements and those of other states. ULM has created a web page with discipline-specific information containing hyperlinks to Licensure Boards in the United States <https://www.ulm.edu/professional-licensure-disclosures/index.html>. Program Directors and/or faculty will discuss this information with you during advising or other program meetings but is also available to answer questions and address any concerns you might have. It is also important to note that licensure or certification requirements are subject to change. Although ULM Program Directors annually review and update licensure information for every state, the faculty recommends that before enrolling in a program and throughout enrollment, students communicate with the applicable state board to confirm understanding and whether upon completion of ULM's program, they will meet requirements.

Thank you for setting a great example for our students. Your commitment to following mask mandate and social distancing guidelines has played a significant role in the reduction of the spread of the COVID virus at ULM.

Due to present circumstances, ULM students, employees, and guests should continue to follow current CDC guidelines by requiring masking and social distancing in all classrooms and buildings throughout campus.

Everyone is encouraged to take advantage of frequent hand-washing, available hand sanitizer, masks, and testing opportunities.

As this is an ever-changing situation, please continue to monitor university communication. For more information click [here](#).

**The course coordinators reserve the right to adjust the syllabus or schedule, in accordance with University and College policies and procedures.**

## X.

**Course Schedule PHRD 4027 Principles of Drug Action II**  
**Class will meet in Bienville B340, Tuesdays and Thursdays at 10:00-10:50 am**

<b>No.</b>	<b>Date</b>	<b>Day</b>	<b>Subject</b>	<b>Instructor</b>
1.	Jan 16 <sup>th</sup>	Tuesday	Introduction to Receptors	Sylvester
2.	Jan 18 <sup>th</sup>	Thursday	Membrane Bound and Nuclear Receptors	Sylvester
3.	Jan 23 <sup>rd</sup>	Tuesday	Introduction to Signal Transduction	Sylvester
4.	Jan 25 <sup>th</sup>	Thursday	Receptor Signal Transduction (Metabotropic & Ionotropic Receptors)	Sylvester
5.	Jan 30 <sup>th</sup>	Tuesday	Receptor Signal Transduction (Metabotropic & Ionotropic Receptors)	Sylvester
6.	Feb 1 <sup>st</sup>	Thursday	Signal Transduction and Transcription Factors Gene Modulation	Sylvester
	<b>February 6<sup>th</sup></b>	<b>Tuesday</b>	<b>Exam #1 (1/16/24 through 2/1/24)</b>	
7.	Feb 8 <sup>th</sup>	Thursday	Route of Administration and Absorption (intro/oral/topical.)	Liu
	<b>February 13<sup>th</sup></b>	<b>Tuesday</b>	<b>Mardi Gras (2/12- to 2/13; no class)</b>	
8.	Feb 15 <sup>th</sup>	Thursday	Membrane Transporters and Absorption	Liu
9.	Feb 20 <sup>th</sup>	Tuesday	Membrane Transporters and Absorption	Liu
10.	Feb 22 <sup>nd</sup>	Thursday	Drug Distribution	Jackson
11.	Feb 27 <sup>th</sup>	Tuesday	Pharmacodynamics (dose response, efficacy)	Jackson
12.	Feb 29 <sup>th</sup>	Thursday	Pharmacodynamics (side effects)	Jackson
13.	Mar 5 <sup>th</sup>	Tuesday	Route of Administration & Absorption (SC/IM/IV)	Jackson
14.	March 7 <sup>th</sup>	Thursday	Termination of Drug Action (renal/biliary/milk excretion)	Jackson
	<b>Mar 12<sup>th</sup></b>	<b>Tuesday</b>	<b>Exam #2 (2/08/24 through 3/05/24)</b>	
15.	Mar 14 <sup>th</sup>	Thursday	Pharmacogenetics (genetic variation/age/sex, etc.)	Liu
16.	Mar 19 <sup>th</sup>	Tuesday	Introduction to Epigenetics	Liu
17.	Mar 21 <sup>st</sup>	Thursday	Drug & therapeutic efficacy I	Barabutis
18.	Mar 26 <sup>th</sup>	Tuesday	Drug & therapeutic efficacy II	Barabutis
19.	Mar 28 <sup>th</sup>	Thursday	Biologics-proteins	Shah
	<b>April 2<sup>nd</sup></b>	<b>Tue-Thu</b>	<b>Spring Break (03/29 to 04/5; no class)</b>	
20.	April 9 <sup>th</sup>	Tuesday	Biologics-enzymes	Shah
	<b>April 11<sup>th</sup></b>	<b>Thursday</b>	<b>Exam #3 (3/12/24 through 3/28/24)</b>	
21.	April 16 <sup>th</sup>	Tuesday	Biologics-antibodies/drug conjugates	Shah
22.	April 18 <sup>th</sup>	Thursday	Biologics-response modifiers	Shah
23.	April 23 <sup>rd</sup>	Tuesday	Introduction to Toxicology (overdose/side effects <i>etc.</i> )	Jackson
24.	April 25 <sup>th</sup>	Thursday	Drug to Drug Toxic Interactions	Jackson
25.	April 30 <sup>th</sup>	Tuesday	Clinical Toxicology (chelation/antidotes/supportive care/dialysis/pH)	Jackson
	<b>May 2<sup>nd</sup>-7<sup>th</sup></b>		<b>Final Exam (05/07; 4/11/24 through 4/30/2024)</b>	