

# PHAR 6732: Medicinal Chemistry and Pharmacology of Cardiovascular Agents

Course Syllabus Fall 2020  
2.3 Credits



This course adheres to the items listed in the College of Pharmacy Central Syllabus:  
[https://docs.google.com/a/umn.edu/document/d/1artQ5e1rbzxe8IEtWo7BE8k8snZAEgMMz\\_QcW8yJ-II/edit?pli=1](https://docs.google.com/a/umn.edu/document/d/1artQ5e1rbzxe8IEtWo7BE8k8snZAEgMMz_QcW8yJ-II/edit?pli=1)

Course Web Site: <http://CANVAS.umn.edu>  
Term: Fall PD2

## Meeting Times & Locations

Day	Time	Duluth Room	Twin Cities Room	Dates
Tuesday	9:05-11:00	Virtual	Virtual	August 25 – September 22
Thursday	10:10-12:05	Virtual	Virtual	August 27– September 24
Monday	8:00-9:55	Virtual	Virtual	September 28 –December 11
Thursday	8:00-9:55	Virtual	Virtual	October 1 – December 13

Technology Help, Twin Cities: 612-301-4357 [help@umn.edu](mailto:help@umn.edu)

## Course Instructional Team

All faculty have an open door policy for students to meet and discuss the course material. Students should feel free to drop by or call their offices any time, or contact the faculty member to schedule an appointment.

Name	Office Location	Phone	Email
L'Aurette Johnson, PhD (Co-Course Director)	WDH 7-115C	612-624-5430	<a href="mailto:joh02745@umn.edu">joh02745@umn.edu</a>
Beshay Zordoky, PhD (Co-Course Director)	WDH 3-120	612-625-6499	<a href="mailto:zordo001@umn.edu">zordo001@umn.edu</a>
Scott Chapman, PharmD	WDH 7-115E	612-624-7143	<a href="mailto:chapm004@umn.edu">chapm004@umn.edu</a>
Ling Li, PhD	MTRF 4-208	612-626-2359	<a href="mailto:lil@umn.edu">lil@umn.edu</a>
Venkatram Mereddy, PhD	Chemistry 136	218-726-6766	<a href="mailto:vmereddy@d.umn.edu">vmereddy@d.umn.edu</a>
Rory Rimmel, PhD	WDH 8-170	612-624-0472	<a href="mailto:remme001@umn.edu">remme001@umn.edu</a>
Anne Schullo-Feulner, PharmD	WDH 7-103	612-626-4858	<a href="mailto:amsf@umn.edu">amsf@umn.edu</a>

Teaching Assistants: See course CANVAS site for roster and contact information

## Overview of the course

### Course content

Medicinal Chemistry and Pharmacology of Cardiovascular Agents builds upon the foundational concepts learned in Phar 6722: Principles of Medicinal Chemistry and Phar 6726: Principles of Pharmacology, and applies them to drug classes primarily used for the treatment of cardiovascular diseases. The content of this course is presented in two units: (1) Antihypertensive agents and (2) Agents for other cardiovascular diseases.

This course fully integrates medicinal chemistry and pharmacology, and aligns strategically with similar concurrent content in Phar 6734: Cellular Metabolism and Nutrition and Phar 6736: Cardiovascular Pharmacotherapy. The overall

objective of this course is to provide a solid scientific foundation that will facilitate understanding of the clinical pharmacotherapy of these agents.

### Course Description

Medicinal Chemistry and Pharmacology of Cardiovascular Agents is an integrated course taught in Pharmacology and medicinal chemistry for each topic will be presented separately in class, however, content will be integrated on exams. The primary method of instruction is lecture-based with the use of video podcast and/or literature or textbook readings as support for class notes and discussions. Basic comprehension of the material is reinforced by an in-class, low-level, low-stakes quizzes at the discretion of the instructor. Review sessions will be a blend of active learning-based discussion designed to build upon lecture material and foster higher-level content integration. A total of 3 non-cumulative exams will be given during the semester.

## Prerequisites

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Phar 6722: Principles of Medicinal Chemistry and Phar 6726: Principles of Pharmacology

## Course Materials

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Required:

- Handouts and lecture slides, available through the course [CANVAS site](#)
- eReserve packet of readings
- eTextbook: Foye's Principles of Medicinal Chemistry, 7th Edition, T. L. Lemke and D. A. Williams, Eds., 2013
- eTextbook: Rang and Dale's Pharmacology, 7<sup>th</sup> Edition, Rang et al., 2012
- eTextbook: Goodman & Gilman's The Pharmacological Basis of Therapeutics, 12<sup>th</sup> Edition, Brunton et al., 2011

Recommended/Optional:

- Basic and Clinical Pharmacology, 12<sup>th</sup> Edition, Katzung et al., 2012
- Pharmacology, 4<sup>th</sup> Edition, Brenner and Stevens, 2012

We expect students to actively take notes during class. The course handouts are a framework for the classes, and are not meant to be a complete, authoritative text. For a discussion about course handouts, note taking, and active learning, see: Brazeau, G. A. Handouts in the Classroom: Is Note Taking a Lost Skill? *Am. J. Pharm. Ed.* **2006**, 70, Article 38.

Class sessions will be recorded and made available to students for download or streaming by the College of Pharmacy.

## Computer/Technology Requirements

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The University of Minnesota computer requirements are listed here:

- CANVAS: This course will use CANVAS to distribute resources and host course activities (quizzes, resources). See CANVAS setup requirements at <http://www1.umn.edu/CANVAS/start/technical.html>.
- E-Textbooks: Some textbooks will be provided as E-Texts. You will access these through the course CANVAS site.
- E-Mail: Course instructors will communicate through email about course administrative issues. We suggest that you check your U of M email daily.
- Clickers: You will need your Turning Point Response Card keypads ("clickers") to participate in lectures and some quizzes.
- Internet-enabled device capable of accessing CANVAS (computer, tablet, etc.)

## Course Goals and Learning Objectives

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Course goals and objectives are based on ACPE Accreditation standards and the expertise of our faculty body, who have identified specific learning Domains and Scientific Objectives, which are available by clicking the links below:

Domains: [https://docs.google.com/a/d.umn.edu/document/d/1n1lqsjUBzlr\\_ZCzXJ5UW7N6FrsgdskgYfzn6K98kkPU/edit](https://docs.google.com/a/d.umn.edu/document/d/1n1lqsjUBzlr_ZCzXJ5UW7N6FrsgdskgYfzn6K98kkPU/edit)

Scientific Foundations: <https://docs.google.com/a/d.umn.edu/document/d/1Zyf4QpHakxB1yubUImbOAL-18uNqzeifurx3tv1F38I/edit>

### Course goal 1

Recognize molecular and cellular processes that underlie the pharmacological mechanisms of action for endogenous mediators and cardiovascular-renal drugs, and relate this information to how these drugs are used in the treatment of cardiovascular diseases.

Objective 1: Identify endogenous signaling molecules that modulate cardiac, renal, vascular, clotting, and atherogenic functions, and recognize and describe how biological processes that alter the impact of these mediators represent potential drug targets.

Objective 2: Identify agents that act as diuretics, vasodilators, hypolipidemics, antiplatelet and anticoagulant agents, antiarrhythmics, and cardiotonics.

Objective 3: For each of the drug classes listed above (objective 1.2), analyze and describe the: (a) Mechanisms of action of prototype drugs in the class, (b) ADME properties of the drug, (c) Effects resulting from drugs, including therapeutic, adverse, and off-target effects, and (d) Effects and uses of drugs that can be affected by coadministration with other drugs.

### Course goal 2

Describe the relationship between chemical structure and biological activity for cardiovascular drugs.

Objective 1: Identify pharmacophores and structure-activity relationships in relation to drug-target interactions.

Objective 2: Explain how physico-chemical properties of drugs affect their ADME properties and therapeutic uses.

Objective 3: Describe chemical pathways of drug metabolism, and how these are affected by genetic polymorphisms and co-administration of other drugs.

Objective 4: Apply the above objectives to the process of making drug therapy decisions.

### Course goal 3

Foster development of critical thinking, analytical skills, and the ability to work with a team to enable the analysis and utilization of medicinal chemistry and pharmacology in a clinical context.

Objective 1: Practice written and oral presentation skills to develop effective communication skills with patients and other health professionals.

Objective 2: Solve clinical questions and problems using critical thinking skills and pharmacology and medicinal chemistry knowledge.

## Assessments and Grading

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**Course Score:** Details about the structure and format of all graded assessments are described below. The course score will be determined by applying the following percentage (weight) to each assessed activity:

Exam 1	200 pts (20%)
Exam 2	200 pts (20%)
Exam 3	200 pts (20%)
10 quizzes	400 pts total (40%) (40pts each quiz)
Total	1000 pts (100%)

A letter grade will assigned using the course score according to the following grading scale:

Grade	A	A-	B+	B	B-	C+	C	C-	D	F
%	100-93	92- 90	89-87	86-83	82-80	79-77	76-73	72-70	69-60	59-0

**Course total grade percentages will be rounded prior to final grade submission. (E.g. if you have a 92.5%, this will round up to a 93%, thereby changing the letter grade from a A- to an A.**

**Online Canvas Quizzes:**

Ten online quizzes will be given via Canvas. Each online quiz will assess material covered from the class periods indicated next to the Canvas Quiz as designated in the course schedule. The number of questions and time allotted to complete the Canvas Quiz will also be noted next to each of the Canvas Quiz. The length of the quiz (number of questions AND time allotted to complete the exam) will be based on the number of lecture hours covered. There will be no more than 15 questions for each quiz with a total time limit to complete the quiz not to exceed 20 mins\*(accommodations will be recognized based on DRC accommodation letters). You will be able to take the quiz anytime within that 24 hour period once opened; however, once the online quiz is opened you will have the indicated allotted time to complete it. The standard make-up policy will apply to all quizzes. Although the online quizzes are open-resource, they are not group projects. Thorough study of the material for each online Canvas Quiz is strongly encouraged as it will prepare you for the open resource unit exam. Each student is expected to take the online quiz independently and submit their own work. Each student is responsible for ensuring that they are appropriately logged into the course website when taking assigned exams. The Canvas quizzes worth 40% of the total course grade (see assessment point value breakdown for each online Canvas Exam for more details).

**Exams:** Exams are, high-stakes assessments that require the application of course content to new problems or situations, and questions will be multiple choice and/or short answer. Each exam will take no more than 1hr\* (accommodations will be recognized based on DRC accommodation letters). You will be able to take the exam anytime within that 24 hour period once opened; however, once the online exam is opened you will have the indicated allotted time to complete it. The standard make-up policy will apply to all exams. Although the online exams are open-resource, they are not group projects and please adhere to the honor code. All exams will be completed using Exam Soft exam portal.

**Technical Support for Online quiz:**

If you require assistance please take the following steps: Step 1 : Visit the technical support website <http://umn.edu/canvas> to troubleshoot your problem through self-help pages. Step 2: If your problem cannot be solved with self-help, call the One Help desk at 218-726-8847 in Duluth or 612-301-4357 in TC. Following these steps will ensure that you get the assistance that you need in a timely manner. Please do not hesitate to contact Tech Support. They are there to help! If you have technical difficulties during an online quiz, or if you are uncertain about your quiz was submitted properly, email the course director immediately, including your chosen answers for the quiz questions.

**MAKE-UP POLICY FOR EXAMINATIONS QUIZZES, etc.:**

Please note MAKE-UP EXAMINATIONS/QUIZZES WILL NOT BE OFFERED EXCEPT UNDER THE FOLLOWING CIRCUMSTANCES: illness, verified by a licensed professional; a family emergency, verified by the professional in attendance; or a University-sponsored event, verified by the sponsoring organization. Additional circumstances will be considered at the discretion of the instructor, but are not likely to be granted. If a student is unable to attend the scheduled exam, the relevant instructor must be notified (by email AND phone) at least 24 hours in advance of the exam time (where possible) . If you do not receive a reply to your request prior to the exam time, please do NOT assume that your request has been granted; contact us again to confirm that your request was received and processed. If an acceptable circumstance or adequate documentation is not provided, a grade of zero on the exam will be assigned. Unless there are extenuating circumstances, students must contact the relevant instructor within 24 hours of the missed exam in order to be considered for a make-up. Depending on the circumstances, the make-up exam date will not be more than one week after the original exam date and will if possible occur before the original exam date.

**STATEMENT OF COMMITMENT TO EQUITY, SUPPORT AND INCLUSION**

We commit to providing academic support to individual students or groups that seek further assistance with course material for PHAR6732: Pharmacology and Medicinal Chemistry of Cardiovascular Agents. Please contact Dr. Johnson and/or Dr. Zordoky if you need help with this course material.

We want our classroom to be a space for all voices, from all cultures, races, ethnicities, genders/gender identities, sexual orientations, and backgrounds. We are open to feedback and suggestions if there is ever any question or issue in this regard. We are happy to serve as listeners and advocates when students experience bias from faculty, students, or others in the College community. You would have our commitment that we would not share this information unless you asked us to. If you feel more comfortable remaining anonymous, please utilize the Course Feedback

Google form posted in the Canvas site to submit anonymous feedback. Please know that we will not be able to follow up with you should you choose to remain anonymous.

As faculty, we are committed to identifying our bias and educating ourselves appropriately. This commitment includes receiving feedback and suggestions from the student body in order to expand our awareness knowing what we would do at the College and in our practices affects our learners and patients. We would be happy to serve as a conduit to connect our learners to pharmacists/faculty/researchers of color, from the LGBTQ+ community, or from other races, ethnicities or cultures if you would like to make connections and seek mentoring from others about their journey.

### University and College of Pharmacy Policies

For information about College-wide policies, see:

[University of Minnesota and College of Pharmacy Policy Reference \(Centralized Syllabus\)](#)

[includes all required UMN and CoP policies, e.g., Attendance; Academic Freedom; Copyright; Course Evaluations; Disability Accommodations; FERPA, etc.]

### Week-by-week schedule

Date	Topic/In-Class Activities  Assessed activities are in <b>bold</b> .	Assignments  Generally, these are to be completed before class	Instructor
Module 1:			
August 25 (T)	Course Introduction	Exam soft – test exam (no points)	Johnson L/ Zordoky
August 25 (T)	Med Chem and Autonomic Pharmacology Review		Meredydy I /Zordoky
August 27(Th)	Anti-hypertensive Agents (2 Hrs)	Quiz 1 open August 28: Autonomic and Anti-hypertensive	Rommel

September 1 (T)	Pharmacology Diuretics 2hrs	Pre-record Renal Physiology lecture (Review prior to Sept 1 lecture)  Quiz 2: Renal Physiology quiz over pre-recorded material)	Zordoky
September 3 (Th)	Med Chem Diuretics (2Hrs)	Quiz 3 opens September 4: Med Chem and Pharmacology of Diuretics	Rommel
September 8 (T)	Pharm Renin-Angiotensin-Aldosterone System (2Hrs)		Zordoky
September 10 (Th)	Med Chem Renin-Angiotensin-Aldosterone System (1-2Hrs)	Quiz 4 opens September 11: Med Chem and Pharmacology of Renin-Angiotensin-Aldosterone System	Rommel
September 15 (T)	<b>Pre-exam 1 review (1hrs)</b>	<b>Exam 1 will open on September 15 at noon for 24 hours. This exam will close Wednesday September 16 noon</b>	Johnson/Zordoky
<b>Module 2:</b>			
September 17 (Th)	Pharmacology and Med Chem Phosphodiesterase Inhibitors (2 Hr)		Rommel
September 22 (T)	Pharm and Med Chem of Vasodilators (2 Hrs)		Rommel

September 24 (Th)	Pharm and Med Chem of Calcium Channel Blockers (2Hrs)	Quiz 5 opens on September 25: Pharmacology and Med Chem Phosphodiesterase Inhibitors, Vasodilators, and Calcium Channel Blockers	Rommel
September 28 (M)	Pharm Hypolipidemics (2Hrs)		Li
October 1 (Th)	Med Chem Hypolipidemics (2Hrs)	Quiz 6 opens October 2: Pharmacology and MedChem of Hypolipidemics	Rommel
October 5 (M)	Pharm Anticoagulants/Anti-Platelets	Pre-record Pharm Purine Receptors lecture (Review prior to Oct 5 lecture)  Quiz 7: Purine Receptor over pre-recorded material)	Schullo-Feulner/ L. Johnson
October 8 (Th)	Med Chem Anticoagulants/Anti-Platelets I(1.5Hrs)	Quiz 8 opens October 9: Pharmacology and MedChem of Anticoagulants/Anti-Platelets	Rommel
October 12 (M)	NO CLASS	NO CLASS	
October 15 (Th)	NO CLASS	NO CLASS	
October 19(M)	<b>Pre-Exam 2 Review (1Hr)</b>	<b>Exam 2 will open on October 19 at noon for 24 hours. This exam will close Tuesday October 20 noon.</b>	Li/Johnson/Rommel/Schullo Feulner

Module 3:			
October 22(Th)	Pharm Antiarrhythmics (Heart Physiology)  Pharm Antiarrhythmic		Chapman  Johnson
October 26(M)	Med Chem Antiarrhythmic (1-2hrs)	Quiz 9 opens Oct 27: Pharmacology and MedChem of Antiarrhythmics	Mereddy
October 29 (Th)	Pharmacology of Agents Used for Heart Failure (2 Hrs)		Zordoky
November 2 (M)	Med Chem Cardiac Glycosides (1hr)  Study Group Activity - "Heart Failure" 1 hrs	Quiz 10 opens Nov 3: Pharmacology and MedChem of Agents used for Heart Failure	Mereddy  Zordoky
November 5 (Th)	<b>Pre-exam 3 review (1Hr)</b>	<b>Exam 3 will open on November 5 at noon for 24 hours. This exam will close Friday November 6 noon</b>	
November 9 (M)	End of Course		

