

Drug Delivery

PHMD 2000

2025 Fall Term

Credit hours: 3 Credit Hours

Class contact hours:

2025 Fall Term: Monday 13:00-15:15 (Lectures, Room 264)

Thursday 9:00-12:00 (Lab Sessions, Room 254/264)

Course Schedule: The course schedule is attached at the end of this document (**Page 7**). Any unavoidable schedule changes will be announced in advance in class, posted on UM Learn, or communicated by email.

Staff:

Course Coordinator: Dr. Xiaochen Gu

Room: Room 317, Apotex Centre

Phone: (204) 474-6903

Email: Xiaochen.Gu@umanitoba.ca

Course Instructors

Instructors	Work Location	Contact Information
Dr. X. Gu	Room 317, Apotex Centre	(204) 474-6903 Xiaochen.Gu@umanitoba.ca
Prof. S. Treacy	Room 218, Apotex Centre	(204) 895-3865 Shirley.Treacy@umanitoba.ca

Lab Steward: Ms. Yadan Qi, Yadan.Qi@umanitoba.ca

Office hours: 9:30-12:00, Monday, 13:30-16:00, Thursday

The course instructors are available to the students in-person, or by email/Zoom. Please send an e-mail to make the appointment; appointments out of regular office hours are also possible through pre-arrangement.

Traditional Territory or Land Acknowledgment:

The University of Manitoba campuses are located on original lands of Anishinaabeg, Ininiwak, Anisininewuk, Dakota Oyate and Dene, and on the National Homeland of the Red River Métis. We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of Reconciliation and collaboration.

Course Description:

PHMD 2000 Drug Delivery 3 cr

(Lab required) This course discusses the concepts and application of various drug delivery and drug administration routes to improve therapeutic outcomes. The course is a continuation of PHMD1012 and PHMD1016, and is directly associated to drug dosage forms and preparations. Registration is normally restricted to students in Year 2 of the program.

PR/CR: A minimum grade of C is required unless otherwise indicated.

Prerequisite: PHMD1012 and PHMD1016.

Purpose of the Course:

Upon successful completion of the course, the students will understand the concepts and applications of various drug delivery routes and their related dosage forms, dosage preparation and requirements, and the correlations between drug delivery efficacy and optimal therapeutic outcomes.

Course Learning Objectives:

Upon completion of this course, students will be able to:

1. Explain the relationship between routes of drug delivery and their therapeutic outcomes;
2. Illustrate the principles of effective and innovative drug delivery in novel dosage form design and development;
3. Summarize different routes of drug delivery in principles and applications:
 - Oral drug delivery
 - Buccal/sublingual drug delivery
 - Nasal/ophthalmic drug delivery
 - Pulmonary drug delivery
 - Topical/transdermal drug delivery
 - Parenteral drug delivery
 - Rectal/vaginal drug delivery
 - Specific targeted drug delivery
4. Identify the needs and differences in drug delivery to achieve various therapeutic outcomes, and devise appropriate strategies from perspectives of dosage forms:
 - Novel drug targeting and medical devices
 - Drug delivery of biological molecules
 - Personalized drug delivery

Assumed Background:

This course builds on the knowledge and skills obtained from PHMD1012 (*Extemporaneous Pharmaceutical Compounding*) and PHMD1016 (*Pharmaceutics*). Knowledge and background of physical chemistry, medicinal chemistry and dosage form preparations are also essential.

Teaching and Learning Methods:

This course is one of the fundamental cornerstones of the Pharmaceutical Sciences and undergraduate Pharmacy curriculum. The importance and relevance of novel drug delivery will be illustrated by examples, assignments and laboratory exercises closely related to pharmacy practice. Current development directions and potential applications will also be included to reflect the latest trends in drug delivery fields.

The course is defined in terms of course goals and objectives. Course information is provided to the students in both lecture and laboratory practice formats. The class will also complete assignments and presentations. The students are encouraged to actively participate in class discussions and laboratory experiments throughout the course. **Attendance to lab sessions is mandatory and lab sessions cannot be rescheduled.**

Assessment Program:

A midterm and a final exam will be used to evaluate the students' knowledge and understanding of the course objectives and goals. The format of the exams (**online by ExamSoft**) will be multiple choice questions. The final exam will cover material taught after the midterm exam (*non-accumulative*). There are two homework assignments that are related to the course material in order to encourage self-learning. Lab sessions will be graded based on the experimental results to be obtained. Feedback in the form of written comments and grades will be provided. Students will have access to their assignments/lab reports for review. Marks achieved during the course will be posted on UM Learn. Final letter grades at the end of the course will be posted on Aurora.

Deadlines are normally set up for completing assignment and lab report, which will be informed to the class beforehand. Extension and late submission of the assignment and/or lab report will be granted whenever a student would need such an accommodation, with appropriate and justifiable reason(s). Please contact teaching staff well in advance if any accommodation is required. Missing assignment and lab report without reason will result in deduction of marks from one's calculation of the course grade.

Assessment Criteria and Grading:

Allocation of Total Marks:

<u>Evaluation</u>	<u>Assessment Date</u>	<u>Proportion of Final Grade</u>
Midterm Exam (2 hr.)	Oct. 9, 2025, 9:00-11:00	30%
Assignment 1	Aug. 28 – Oct. 30 (due by Oct. 30, 2025)	20%

Assignment 2	Nov. 3 – Nov. 27 (due by Nov. 28, 2025)	10%	
Final Exam (2 hr.)	Dec. 3, 2025, 9:00-11:00	30%	
Lab assessments	Throughout the term	10%	
Final Grades: $\geq 90\%$	A+	65-69%	C+
80-89%	A	60-64%	C
75-79%	B+	50-59%	D
70-74%	B	<50%	F

Assessment Policies:

Exams/Assignments: They are designed to evaluate a student's ability to answer questions (both theoretical and practical) by using knowledge and skills learnt from this course.

Laboratory Session Assessments: It is designed to evaluate a student's lab skills and problem-solving ability by planning and executing various bench experiments, summarizing the results, and writing up a lab report. Knowledge and hands-on experience from laboratory exercises are needed to produce accurate experimental results.

Note: All students MUST MAKE THEMSELVES AVAILABLE FOR LECTURES, LAB SESSIONS AND EXAM PERIODS, AS INDICATED IN THE UNIVERSITY GENERAL CALENDAR, THE COLLEGE OF PHARMACY EXAM TIMETABLE, STUDENT HANDBOOK, AND COURSE OUTLINE. **Deferred exams will not be granted to accommodate vacations. Only illness, bereavement, or exceptional compassionate circumstances will be considered for deferred exams or assignments. Students participating on University of Manitoba sanctioned sports teams (Bison Sports) should discuss arrangements (if necessary) with the course coordinator.**

Course Technology:

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. Students can use all technology in classroom and laboratory settings only for educational purposes approved by the instructors and/or the University of Manitoba Disability Services. Students should not participate in personal direct electronic messaging / posting activities (e-mail, texting, video or voice chat, wikis, blogs, social networking (e.g., Facebook) online and offline "gaming" during scheduled class time. Course materials are provided on UM Learn and can be accessed electronically at <http://universityofmanitoba.desire2learn.com/d2l/login>.

The course coordinator and instructors of this course and the University of Manitoba hold copyright over the course materials, presentations, and lectures/lab sessions that form part of this course. **No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of the course coordinator.** Course materials (both paper and digital) are for the participant's private study and research.

Special virtual classroom recommendations for the course (*wherever needed*): 1). Log-in 3 minutes before the session time to accommodate for any potential technical difficulties; 2). When joining a session please ensure that your microphone is muted; 3). Video cameras are not required for participation in the session but encouraged in class discussions; 4). The chat function will be active during online sessions, feel free to ask questions at any time; 5). Cell phone use should be kept to minimum during virtual session.

Voluntary Withdrawal (VW):

Course feedback and assessment will be provided before the voluntary withdrawal (VW) date. For the 2025-2026 academic year, the VW date for this course is November 3, 2025. PLEASE NOTE HOWEVER, STUDENTS CONTEMPLATING VOLUNTARILY WITHDRAWING FROM A COURSE SHOULD SPEAK TO THE DEAN'S OFFICE BEFORE DOING SO. THERE ARE SIGNIFICANT CONSEQUENCES OF WITHDRAWING FROM A COURSE DURING THE PROFESSIONAL PROGRAM.

Academic Integrity (Plagiarism, Cheating and Personation):

Please review the official College of Pharmacy Policies on Plagiarism and Cheating, clearly outlined in your Pharmacy Student Handbook for 2025-2026 and the University of Manitoba Academic Calendar at: <https://catalog.umanitoba.ca/undergraduate-studies/general-academic-regulations/> These policies directly apply to this course.

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Student Accessibility Services (SAS):

If you are a student with a disability, please contact SAS for academic accommodation supports and services. Students who have, or think they may have, a disability (e.g., mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange for a confidential consultation.

Student Accessibility Services <http://umanitoba.ca/student-supports/accessibility/>

520 University Centre

204-474-7423

Student_accessibility@umanitoba.ca

Student Support:

Please refer to the attached Schedule "A" for a list of student supports provided by the University of Manitoba.

Recommended Texts and References:

All course material, including lecture notes, lecture presentations, laboratory notes, laboratory report templates, and any other essential handouts will be distributed to the students (available on UM Learn) prior to each session.

Meeting AFPC Educational Outcomes and NAPRA Competencies:

Course Objectives (At the completion of this course, the student should be able to)	AFPC Educational Outcome (2017) Achieved	NAPRA Competency (2024) Achieved	CPSI Competency Domain (2019)	Learning Level (Ideas, Connections, Extensions)	Performance Level (Novice, Functional, Competent)
To explain the relationship between routes of drug delivery and their therapeutic outcomes	SC 1.1	1.7.1 1.7.2 1.7.6	Domain 5.2	Ideas	Functional
To illustrate the principles of effective and innovative drug delivery in novel dosage form design and development	SC 1.1	1.6.3 1.7.1 1.7.2 1.7.6	Domain 5.2	Connections	Functional
To summarize different routes of drug delivery in principles and applications	SC 1.1	1.7.1 1.7.2 1.7.5 1.7.6	Domain 5.2	Connections	Functional
To identify the needs and differences in drug delivery to achieve various therapeutic outcomes, and devise appropriate strategies from perspectives of dosage forms	SC 1.2 SC 3.1	1.6.3 1.7.1 1.7.2 1.7.5 1.7.6	Domain 5.2	Connections	Functional

Course Schedules:

Date	Subject	Instructor
August 25, 2025 (M)	Course Introduction/Oral Delivery (<i>I</i>)	Dr. Gu/Prof. Treacy
August 28, 2025 (T)	Lab Orientation/Assignment Briefing	Prof. Treacy/Dr. Gu
September 1, 2025 (M)	<i>Labour Day, No class</i>	
September 4, 2025 (T)	Lab 1 , Specialized Tablets & Testing (<i>Part 1</i>)	Prof. Treacy/Dr. Gu
September 8, 2025 (M)	Oral Delivery (2)	Prof. Treacy
September 11, 2025 (T)	Lab 1 , Specialized Tablets & Testing (<i>Part 2</i>)	Prof. Treacy/Dr. Gu
September 15, 2025 (M)	Sublingual & Buccal Delivery	Dr. Gu
September 18, 2025 (T)	Lab 1 , Specialized Tablets & Testing (<i>Part 3</i>)	Prof. Treacy/Dr. Gu
September 22, 2025 (M)	Nasal Delivery	Dr. Gu
September 25, 2025 (T)	Topical & Transdermal Delivery	Dr. Gu
September 29, 2025 (M)	Pulmonary Delivery	Dr. Gu
October 2, 2025 (T)	Lab 2 , Drug Diffusion & MDIs	Prof. Treacy/Dr. Gu
October 6, 2025 (M)	Ocular & Ophthalmic Delivery	Prof. Treacy
October 9, 2025 (T)	Midterm Exam (<i>ExamSoft</i>), 9:00AM-11:00AM	Dr. Gu
October 13, 2025 (M)	<i>Thanksgiving Day, No class</i>	
October 16, 2025 (T)	Lab 3 , Compounding Lab (<i>CAPSI Prep</i>)	Prof. Treacy/Dr. Gu
October 20, 2025 (M)	Rectal & Vaginal Delivery	Prof. Treacy
October 23, 2025 (T)	Parenteral Delivery Scientific Writing (<i>Assignment Groups</i>)	Dr. Gu
October 27, 2025 (M)	Specific Targeted Delivery	Dr. Gu
October 30, 2025 (T)	Assignment 1 (<i>Due Time</i>)/Discussion Groups	Dr. Gu
November 3, 2025 (M)	Medical Devices	Dr. Gu
November 6, 2025 (T)	Effective Preparation Skills/Assignment 2	Dr. Gu
November 10-14, 2025	<i>Fall Break, No class</i>	
November 17, 2025 (M)	Pharmaceutical Packaging	Prof. Treacy
November 20, 2025 (T)	Lab 4 , Drug Content	Prof. Treacy/Dr. Gu
November 24, 2025 (M)	Assignment Group Preparation	
November 27, 2025 (T)	Assignment 2 Group Presentations	Dr. Gu/Prof. Treacy
December 3, 2025	Final Exam (<i>ExamSoft</i>), 9:00AM-11:00AM	Dr. Gu