

**Phar 6162 Principles of Drug Delivery II
Spring 2007, 3 credits**

Course Director: Raj Suryanarayan (Sury)
9-127B WDH. Phone : 612-624-9626
e-mail : surya001@umn.edu
Office hours: By Appointment

UMTC Course Instructors: Cheryl L. Zimmerman, Ph.D.
WDH 9-149B, (612) 624-4611, (612) 624-5151
e-mail: zimme005@umn.edu
Office hours: Wednesday 12:15 – 1:15 PM

Ronald A. Siegel, D.Sc.
WDH 9-127E, (612) 624-6164
e-mail: siege017@umn.edu
Office hours: Wednesday 12:15 – 1:15 PM

UMD Course Instructor Gregory Rutkowski
Office at the Duluth Campus: (218) 726-7828, FAX (218) 726-6907
e-mail: grutkows@umn.edu
Office hours: Tuesday 12:15 – 1:15 PM; Kirby Plaza Cube A

UMTC Teaching Assistants Laura A. Maertens, B.S.
WDH 9-149, (612) 625-4987
email: maert006@umn.edu
Office hours: By Appointment

Sagar Agarwal, B.S.
Office: WDH 9-104, (612) 624-8947
e-mail: agar0077@umn.edu
Office hours: By Appointment

UMD Teaching Assistant Chelsea Brezinka, UMD PDIII
Office: Pharmacy Reading Room 315 C/D Kirby Plaza
e-mail: brez0036@d.umn.edu
Office hours: TBA

Lecture hours 2:30 p.m. – 3:20 p.m.

UMTC	Mon and Fri	7-135 WDH
	Wed	1-450 Moos Tower
UMD	Mon, Wed, Fri	389 Kirby Plaza

Tutorial sessions

UMTC	Tuesday and Thursday	12:15 to 1:05 PM
	Moos 2-530 (except on Jan 25, Feb 1, March 8 & 29 – Moos 1- 450)	
UMD	Thursday	12:15 to 1:15 PM
	395 Kirby Plaza	

Additional Office Hours : By appointment.

Course Objectives: To introduce the student to physicochemical principles that are relevant in the design, preparation, use and evaluation of pharmaceutical dosage forms

Learning objectives

- Identify the different rates of decomposition reactions and calculate the shelf-life of pharmaceutical formulations.
- Explain the role of interfacial phenomena in the design of dosage forms.
- Select surfactants for use in the preparation of formulations.
- Design suspension formulations by taking into consideration the electric properties of the suspended drug particles.
- Recognize the different types of flow behavior of fluids.
- State Fick's laws of diffusion and apply them to selected pharmaceutical systems and to biological processes
- Recognize the role of particle size distribution on the performance of dosage forms.
- Identify and relate the properties of polymers to their potential use in pharmaceutical systems.
- Identify the role played by partitioning in drug formulation and transport. Relate partitioning to solubility, and particular molecular factors.
- Explain how the primary, secondary and tertiary structure of proteins affects their physical and chemical stability.
- Identify disperse, semisolid, transdermal and suppository dosage forms, and the excipients required for formulation of a pharmaceutically elegant product.
- Recognize the potential and source for physical incompatibilities in formulations.
- Recognize the role of complexation and protein binding on the performance of dosage forms
- Recognize the meaning of the acronym ADME and describe the factors affecting absorption through biological membranes.

TEXTBOOKS

Required. *Course Handouts*

Supplementary. (all of these are in Biomedical Library, TC Campus).

- Martin's Physical Pharmacy and Pharmaceutical Sciences, Ed. P. A. Sinko, 5th edition, Lippincott, Williams and Wilkins, PA, 2006.

- Remington: The Science and Practice of Pharmacy, Ed. University of the Sciences in Philadelphia, 21st edition, Lippincott, Williams and Wilkins, PA, 2005.

The following two texts were required for Phar 6161. They will also be used in Phar 6162

- A.T. Florence and D. Attwood, Physicochemical Principles of Pharmacy, 4th edition, Pharmaceutical Press, London, UK, 2006.
- L.V. Allen, N.G. Popovich and H.C. Ansel, Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, 8th edition, Lippincott, Williams and Wilkins, PA, 2004.

Course requirements: The students are expected to attend all the lectures. There will be three examinations. The examinations will include questions in one or more of the following formats- multiple choice, short answers, derivations, problem solving and true/false. Four assignments will be given during the quarter. The assignments **MUST** be submitted by the due date. Each assignment carries 7.5% of the total grade.

The assignments as well as the midsemester examinations should be written in ink. If you use a pencil, then the assignment/examination will NOT be regraded. Regrading request must be submitted within a week from the day the graded exam/assignment is returned.

Cell phones must be turned off during the lecture hour.

Grading policy

Assignments	30%
Exam I	15%
Exam II	15%
Exam III	15%
Final Exam (comprehensive)	25%

Percentage	Grade
90 and above	A
87 - 89	A-
83 - 86	B+
79 - 82	B
76-78	B-
73-75	C+
69-72	C
66-68	C-
63-65	D+
56-64	D
Less than 56	F

Make-up Policy: A make-up exam will be scheduled only under one of the following University-prescribed circumstances: illness, verified by a note from a doctor; a family emergency, verified by a note from the professional person in attendance; a University-sponsored event, verified by a note from the leader of the sponsoring organization. The instructor must be notified **IN ADVANCE**.

Course Evaluation: Students will have an opportunity to evaluate the course, possibly on line.

Honor Code : Each student is bound by the following specific provisions as part of the Code: Academic misconduct is any unauthorized act which may give a student an unfair advantage over other students, including but not limited to: falsification, plagiarism, misuse of test materials, receiving unauthorized assistance and giving unauthorized assistance. Specifically, each student

will be required to do their own work on all assignments, midsemester and final examination. Students are allowed, and in fact encouraged, to work with their colleagues to complete the in-class assignments.

Disability Accommodations: Any student with a documented disability (e.g. physical learning, psychiatric, vision, hearing etc.) who needs to arrange reasonable accommodations must contact the Course Director (612 624-9626) and Disability Services (612-626-1333 – Twin Cities; 218 726 7966) at the beginning of the semester. All discussions will remain confidential.

Assignment Requirements: All of the following requirements must be met. If not, you run the risk of the assignment not being accepted/graded.

- Assignments should be completed on letter size paper (8 ½ x 11”) with clean edges. If you use notebook paper you must remove the frayed edges.
- Your name should be written *legibly* on *all* the pages of your assignment.
- All the pages of the assignment should be **stapled** together. It is NOT acceptable to fold the corners together or use paperclips. .
- The answers should be *clear* and *legible*. The entire question must be answered in one area.
- Assignments must be handed in *before the start of lecture*. After the lecture begins, the assignments will **NOT** be accepted.
- Graphs, if required, should be drawn clearly on a standard graph paper. A sample graph paper has been posted on Web CT. No other graph paper will be accepted.

Assignments – general comments

- Show all your work to receive full credit.
- Circle or box your final answer

SCHEDULE OF LECTURES

Jan 17 – Jan 22	Introduction to the course (Sury)
Jan. 17 – Jan. 22	Disperse Dosage forms (Zimmerman)
Jan 24 – Jan 26	Powders (Siegel)
Jan 29 – Feb 7	Interfacial phenomena (Sury)
Feb 9 – Feb 12	Colloidal Systems (Sury)
February 14	Exam I (Siegel, Sury, Zimmerman)
Feb 16 – Feb 19	Proteins and protein Stability (Siegel)
Feb 21 – Feb 23	Semisolid and Transdermal Dosage forms (Zimmerman)
Feb 28 - March 5	Polymers (Siegel)
Mar 7 – Mar 9	Partitioning (Siegel)
Mar 12 – Mar 16	Spring Break
Mar 19	Partitioning (Siegel)
March 21 – March 23	Rheology (Siegel)
March 26	Exam II (Siegel and Zimmerman)
Mar 28 – April 6	Chemical Kinetics and drug Stability (Sury)
April 9 – April 13	Physical Incompatibilities, Complexation, Protein binding (Zimmerman)
April 16 - April 25	Mass Transport / Diffusion (Sury and Siegel)
April 27 – May 2	Introduction to ADME: Absorption (Zimmerman)
May 4	Exam III (Rutkowski, Sury and Zimmerman)
May ...??....	FINALS (Comprehensive – Rutkowski, Siegel, Sury and Zimmerman)

Week	Date	In class Activity	Instructor
1	January-17	Introduction to the Course	Dr. Sury; Dr. Zimmerman
	January-19	Disperse Dosage Forms	Dr. Zimmerman
2	January-22	Disperse Dosage forms	Dr. Zimmerman
	January-24	Powders	Dr. Siegel
	January-26	Powders	Dr. Siegel
3	January-29	Interfacial Phenomena	Dr. Sury
	January-31	Interfacial Phenomena	Dr. Sury
	February-2	Interfacial Phenomena	Dr. Sury
4	February-5	Interfacial Phenomena	Dr. Sury
	February-7	Interfacial Phenomena	Dr. Sury
	February-9	Colloidal Systems	Dr. Sury
5	February-12	Colloidal Systems	Dr. Sury
	February-14	Exam I	
6	February-16	Proteins and protein Stability	Dr. Siegel
	February-19	Proteins and protein Stability	Dr. Siegel
	February-21	Semisolid and Transdermal Dosage Forms	Dr. Zimmerman
7	February-23	Semisolid and Transdermal Dosage Forms	Dr. Zimmerman
	February-26	Suppository Dosage forms	Dr. Zimmerman
	February-28	Polymers	Dr. Siegel
8	March-2	Polymers	Dr. Siegel
	March-5	Polymers	Dr. Siegel
	March-7	Partitioning	Dr. Siegel
9	March-9	Partitioning	Dr. Siegel
	March-12		
	March-14	SPRING BREAK	
10	March-16		
	March-19	Partitioning	Dr. Siegel
	March-21	Rheology	Dr. Siegel
11	March-23	Rheology	Dr. Siegel
	March-26	Exam II	
	March-28	Chemical Kinetics and Drug Stability	Dr. Sury
12	March-30	Chemical Kinetics and Drug Stability	Dr. Sury
	April-2	Chemical Kinetics and Drug Stability	Dr. Sury
	April-4	Chemical Kinetics and Drug Stability	Dr. Sury
13	April-6	Chemical Kinetics and Drug Stability	Dr. Sury
	April-9	Physical Incompatibilities	Dr. Zimmerman
	April-11	Complexation	Dr. Zimmerman
14	April-13	Protein Binding	Dr. Zimmerman
	April-16	Mass Transport / Diffusion	Dr. Rutkowski
	April-18	Mass Transport / Diffusion	Dr. Rutkowski
15	April-20	Mass Transport / Diffusion	Dr. Rutkowski
	April-23	Mass Transport / Diffusion	Dr. Rutkowski
	April-25	Mass Transport / Diffusion	Dr. Rutkowski
16	April-27	Introduction to ADME: Absorption	Dr. Zimmerman
	April-30	Factors Affecting Absorption	Dr. Zimmerman
	May-2	Factors Affecting Absorption	Dr. Zimmerman
	May-4	Exam III	
	TBA	COMPREHENSIVE FINAL	

