

Special Topics in Biomedical Engineering: Biomaterials for Drug Delivery

BME6938 Section IMME

Class Periods: Tuesday Period 7 (1:55-2:45 PM) and Thursday Periods 7-8 (1:55-3:50 PM)

Location: Black Hall (BLK) 315

Academic Term: Spring 2025

Instructor:

Blanka Sharma

blanka.sharma@bme.ufl.edu

352-273-9329

Office Hours: Tuesday 3:00-4:00 PM, Thursday 4:00-5:00 PM

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

N/A

Course Description

This course provides an overview of the principles and applications of controlled release/drug delivery systems. The course integrates topics in pharmacokinetics/pharmacodynamics, polymer chemistry, biomaterials, and mass transport phenomena. The course includes discussion of emerging gene and cell delivery technologies. 3 Credits.

Course Pre-Requisites / Co-Requisites

Undergraduate or graduate physiology, biology, or anatomy course.

Undergraduate or graduate transport phenomena course.

Course Objectives

1. Apply engineering principles to the design of controlled release and drug delivery systems.
2. Understand the biomaterials used in the engineering of drug delivery systems for various applications and evaluate drug release, pharmacokinetics, and pharmacodynamics.
3. Analyze and critique current literature on drug delivery technologies.

Materials and Supply Fees

N/A

Required Textbooks and Software

No required textbook.

Recommended Materials

Title: Drug Delivery: Fundamentals and Applications, Second Edition

Second Edition

Authors: Anya M. Hillery, Kinam Part

Publisher: CRC Press, Taylor and Francis

ISBN: 9781482217711

Note: Older version of this text is also acceptable.

Title: Drug Delivery and Targeting: For Pharmacists and Pharmaceutical Scientists.

Authors: Anya M. Hillery, Andrew W. Lloyd, James Swarbrick

Copyright date:2001

Publisher: Taylor and Francis

ISBN: 9780415271981

Title: Engineering Principle of Drug Delivery

Author: Mark Saltzman

Copyright Date: 2001

Publisher: Oxford University Press
ISBN: 0-19-508589-2

Course notes are derived primarily from both the recommended textbooks listed. Some course notes are derived from published review articles, and will be provided to students accordingly.

Required Computer

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>

Course Schedule

Note that schedule is tentative and subject to change based on instructor discretion course progress, and class participation.

Week 1: Introduction to Drug Delivery; Pharmacokinetics/Pharmacodynamics
(Hillery Ch. 1-3)

Week 2: Pharmacokinetics/Pharmacodynamics
(Hillery Ch. 1-3, Saltzman Ch. 7)
Journal Club #1 (Instructor-led)

Week 3 Mass Transport and Rate Control in Drug Delivery Systems
Homework #1

Week 4 Application of Polymers in Drug Delivery Systems
Journal Club #2 (Instructor-led)

Week 5 Design of Bioresponsive Drug Delivery Systems
Homework #2

Week 6 Parenteral Drug Delivery Systems (Hillery Ch. 4-5, Saltzman Ch. 9-10)
Student-led Journal Club

Week 7 Drug Targeting and Nanomedicine (Hillery Ch. 5)
Case Study
Homework #3

Week 8 Gene/Nucleic Acid Delivery (Hillery Ch. 14)
EXAM 1

Week 9 RNA Delivery; Cells as Drugs and Drug Delivery Systems
Student-led Journal Club

Week 10 SPRING BREAK

Week 11 Oral Drug Delivery (Hillery Ch. 6)
Student-led Journal Club

Week 12 Transdermal Drug Delivery (Hillery Ch. 8)
Student-led Journal Club

Week 13 Pulmonary Drug Delivery (Hillery Ch. 10)
Student-led Journal Club
Homework #4

Week 14 AI/ML and Drug Delivery
Student-led Journal Clubs

Week 15 EXAM 2

Important Dates

Thursday, January 30th, Journal Club Assignments will be made (need to submit preferences by this date)

Thursday, March 6th, Exam 1

Tuesday, April 22nd, Exam 2

Attendance Policy, Class Expectations, and Make-Up Policy

Excused absences must be consistent with university policies in the Graduate Catalog (<https://catalog.ufl.edu/graduate/regulations>) and require appropriate documentation. Additional information can be found here: <https://gradcatalog.ufl.edu/graduate/regulations/>

Students are expected to attend course lectures and participate in class discussions. It is expected that there will be no cell phone or electronic device distractions in class. If you are unable to attend class, will be coming late or leaving early, then you are expected to inform the instructor. Students are expected to be in class, prepared to learn, engaged, and overall contributors to the learning environment. Poor attendance will affect your participation grade.

Unless prior arrangements have been made with the instructor, students will be deducted 15% per day for late coursework, with deductions occurring at the time associated with the due date. Unless prior arrangements have been made with instructor, missed exams will receive a grade of 0pts.

While students are encouraged to discuss course material and assignments together outside of class, it is expected that all coursework/assignments submitted is the students' own work.

Evaluation of Grades

Assignment	Percentage of Final Grade
Homework/Assignments (4)	30%
Exams (2)	40%
Journal Club Project	15%
Participation	15%
	100%

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00

60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Coordinator
- HWC OE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://elearning.ufl.edu/>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.