

BME 4320/5320: Drug Delivery – Spring 2018

BME 4320/5320: DRUG DELIVERY Spring 2018

Credit hours: 3

Prerequisites: BME-4400, BME-2200, BME-3300, BME-3400, MATH-3550

Time: Tuesday/Thursday, 12:45 – 2:00 pm

Location: MDH 1016

Instructor: Dr. Silviya P Zustiak

E-mail: silviya.zustiak@slu.edu

Office phone: 314-977-8331, 9:00 am – 6:00 pm

Emergency phone number: In case of emergency, please call the departmental main office at 314-977-8292

Office: BME building, Rm. 2024

Office hours: W 9:30 – 10:30 am, and by appointment

Required text: Saltzman, M., *Drug Delivery: Engineering Principles for Drug Therapy*, Oxford University Press, 2001

Optional: Hillary A. and Kinam P., *Drug Delivery: Fundamentals and Applications*, CRC Press, 2017

Additional reading materials will be assigned for specific lectures. The respective pdf files will be available for download from the Blackboard course site.

Academic Integrity Policy:

As a professional and as a student of Saint Louis University, you are subject to the strictest standards of academic honesty. Any academic dishonesty may result in failure of this course and will be reported to the Chair of the BME Department and/or the Dean.

Course description:

This course will cover various modes and engineered vehicles for drug delivery, including nano- and micro-spheres, transdermal drug delivery systems (DDS), implant drug delivery, targeted delivery, hydrogels for sustained delivery, etc. The class will also cover some of the transport, especially diffusion fundamentals, but also convection and basic pharmacokinetics models.

Course topics:

Fick's first and second law

Diffusion coefficients: meaning and measurements

Diffusion from hydrogels, including responsive and degradable systems

Principles of controlled release

Transdermal Drug Delivery Systems (DDS)

Drug delivery to the central nervous system

Drug targeting

Drug modification

BME 4320/5320: Drug Delivery – Spring 2018

Drug discovery and high-throughput screening
Particulate delivery systems: nano- and micro-carriers
Nanotechnology and drug delivery
Cancer and chemotherapeutic delivery
Drug permeation

Important dates and deadlines:

Disclaimer: the dates and deadlines are subject to change due to unforeseen circumstances.

Group project will be assigned on February 13th
First Project Report due - March 6th
Second Project Report Due, Gallery Walk “Pitch your project design” - April 3rd
Final project report due – May 1st
Project oral presentations – May 5th
Midterm 1 – February 27th
Midterm 2 – April 17th
Final – May 10th

Grading scale:

Attendance and participation	5%
Homework	20%
Group project	25%
Midterm exams (2 exams)	30% (15% per exam)
Final exam	20%

A = 93 – 100%; **A-** = 90 – 92%
B = 83 – 86%; **B+** = 87 – 89%; **B-** = 80 – 82%
C = 73 – 76%; **C+** = 77 – 79%; **C-** = 70 – 72%
D = 60 – 69%
F = below 60%

Homework and grading policies:

Homework from a prior week is due at the start of each class. Late homework will NOT be accepted, unless caused by: 1) a family emergency; 2) an illness (doctor’s note required). Excused late homework and any other missed work has to be submitted within 2 weeks of returning to school.

Exams – no make-up exams will be given. If you have conflict with the scheduled exams, listed in this syllabus, please notify Dr. Zustiak within the first week of classes. All exams are open-book and open-notes.

Attendance for this class is required and participation is strongly encouraged. The class will be divided into small groups. Small group and entire class discussions will be initiated throughout the semester. Attendance and participation jointly represent a portion of your grade.

Rules of conduct:

BME 4320/5320: Drug Delivery – Spring 2018

- As a courtesy to others, disruptive behaviors such as talking during lecture is strongly discouraged, unless prompted by the instructor.
- No food or drink allowed during class.
- Laptop usage should be restricted to note-taking only.
- Cell phones should be silenced or turned off during class.
- Late arrivals are generally disruptive to the whole class and should be avoided. Please, notify me (the instructor) at the beginning of the semester if another class will regularly interfere with your timely arrival.
- Only one unexcused absence is allowed. Further unexcused absences will result in up to 5% reduction of your final grade. Absence due to family emergency or illness (accompanied by a doctor's note) will be excused.

Additional information:

Please, refer to your course “Blackboard” for special announcements, your current grade, or additional reading materials.

BME 4320/5320: Drug Delivery – Spring 2018

Please note that all dates and topics are subject to change.

Date	Lecture Topic
1/16	Syllabus and Introduction to Drug Delivery
1/18	Drug discovery and high-throughput drug screening
1/23	Drug Administration and Drug Effectiveness
1/25	Fick's first and second law
1/30	Solutions to Fick's law – geometry, generation and elimination
2/1	The diffusion coefficient – measurements and basics
2/6	Models for predicting the diffusion coefficient; Amsden paper
2/8	Diffusion in membranes, polymer solutions and gels/hydrogels; Peppas paper
2/13	Principles of controlled release; Group Project assigned
2/15	Reservoir and matrix DDS
2/20	Matrix and hydrogel DDS
2/22	Drug modification: enhancing agent solubility and stability
2/27	Midterm Exam 1
3/1	Polymer based drug delivery devices
3/6	Common drug delivery polymers
3/8	Short project presentations; Drug targeting
3/13	NO CLASS – Spring Break
3/15	NO CLASS – Spring Break
3/20	Degradable delivery systems
3/22	Particulate and injectable delivery systems
3/27	Smart DDS
3/29	NO CLASS – Easter Break
4/3	Gallery Walk in class activity
4/5	Nucleic acid delivery
4/10	Guest Lecture: Prof. Andriana Montano, SLU - Morquio
4/12	Cancer nanomedicine and chemotherapeutic delivery
4/17	Midterm Exam 2
4/19	Guest Lecture: Prof. John Tavis, SLU – “Early-stage drug discovery targeting the Hepatitis B Virus ribonuclease H”
4/24	Transdermal Drug Delivery Systems (DDS)
4/26	Drug delivery to the central nervous system
5/1	Project Presentations
5/3	Topics overview
5/10	12:00 – 1:50 pm - Final Exam