

BE 5373-004 (90305): DRUG DELIVERY LAB
BE 4373-004 (90299): FORMULATION DRUG DELIVERY SYSTEMS

Fall 2018

Instructor(s): Kytai Truong Nguyen

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Faculty profile: <https://mentis.uta.edu/explore/profile/kytai-nguyen>

TA: Roshni Iyer, roshni.iyer@mavs.uta.edu

TA Office Hours: Fridays 3 PM- 4 PM at TBD (prior appointment required)

Section Information: BMES 5373-004 (29352), Drug Delivery Laboratory

Time and Place of Class Meetings: ERB 273, Fridays: 9:00 AM - 11:50 AM

Description of the Course Content: This class will provide students with hands-on experience in developing drug delivery systems such as hydrogels, scaffolds, microparticles and/or nanoparticles that can be loaded with and release pharmaceutical agents to treat various diseases. The emphasis is synthesis, characterization, and pharmacokinetic studies of these drug delivery systems.

Student Learning Outcomes: Lab reports and presentations are applied for measuring the student learning outcomes in the long-term. In addition, questions will be given in each lab, and student participation will be used to ensure that student learning outcomes are met. Students are expected to know how to make drug delivery systems such as hydrogels, microparticles and nanoparticles for controlled drug delivery applications. Students should also know how to determine drug loading efficiency and drug release kinetics for each experiment.

Requirements: Students should have some biomaterials background and already take the drug delivery system class. **Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. If the students do not complete the safety training, they are to receive zero grades in their course work until the training is completed, per the Provost's Office.** The Provost also publishes the verbiage that instructors are to place in their syllabus related to the training.

Textbooks and Other Course Materials:

Required books:

Course handouts will be distributed in class.

Access to the class information: Students can access class information including class syllabus and project samples on blackboard, using their username: uta/netid, and password: netid password.

Students need to sign in, and then click on the class folder to find BE 5373 folder for this class's documents. All lectures and some related documents are included in the class folder.

Descriptions of major assignments and examinations with due dates: Students need to attend lectures, read and understand all handouts and protocols. Students are also expected to participate in discussions of problems presented during lecture periods. Presentations and written reports are required to develop communication skills for graduate students. **Students are expected to work independently on reports.**

Students will work in groups for each experiment; however, students should work on their own for the lab reports. Even though data for each experiment will be the same within the group, each student should conduct the calculations individually. Any similarities in the report between students will result in '0' points for each student.

Format of lab reports should be similar to a peer reviewed journal articles such as Journal of Controlled Release. Lab reports should include these sections: abstract, introduction (background information), materials and methods (short description of your experiments), results and discussion with limitations and potential solutions, conclusion, and references. There is no page limitation for the lab report. An example of lab reports is included in the class folder. **A paper copy and e-copy are both required and due to the TA before 9 am on the designated date.**

Requirement for final experiments: For the final experiment, groups of students will have the freedom to select any drug delivery system from the literature to work on. The students need to get together with TA to see if chemicals for the experiments are available or not in advance. If the chemicals and equipment are not available, the students might need to choose another alternative. The students should give rationales for selecting the system and generate the protocols for manufacturing and characterizing of that drug delivery system. The group should have the final design and protocol approved by the instructor and TA before performing any experiments associated with this project.

Students should refer to the class schedule at the end of this handout for the dates to turn in your reports. Reports are due before 9 am on the due date. Late submissions will not be accepted and/or penalized with 50% of the points for that report, unless accompanied by prior permission from the instructor.

There will be no make-up given for lab reports, unless the reason is explained with accompanying document (e.g. a doctors' note).

Attendance Policy: At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I have decided that student should attend the class as much as he/she can. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

Other Requirements: Students should have some biomaterials background.

Grading:

COURSE ASSESSMENT

Reports (2 total)	34% (17% each)
Final experiment design and protocol	10%
Final Report	20%
2 presentations	20% (10% each)
Quiz	10%
Attendance, participation and cleanliness	6%

EVALUATION OF STUDENTS

A	85-100%
B	70-85
C	60-70
D	50-60
F	Below 50%

Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels; see “Student Support Services,” below.

Make-up Exams: There will be no make-up given for missed exams, unless the reason is explained with an accompanying document.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, and others.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog.

For undergraduate courses, see <http://catalog.uta.edu/academicregulations/grades/#undergraduatetext>; for graduate courses, see <http://catalog.uta.edu/academicregulations/grades/#graduatetext>. For student complaints, see <http://www.uta.edu/deanofstudents/student-complaints/index.php>.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wweb.uta.edu/ses/fao>).

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. All instructors at UT Arlington are required by law to provide “reasonable accommodations” to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a **letter certified** by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting: **The Office for Students with Disabilities, (OSD)** www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

Non-Discrimination Policy: *The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.*

Title IX: The University of Texas at Arlington (“University”) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington’s tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents’ Rule 50101, §2.2, suspected violations of university’s standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University. Additional information is available at <https://www.uta.edu/conduct/>.

Note: A student should use his/her own words to write his/her lab report i.e. he/she should not copy words by words from a journal or information on a website or from another student. Copying the sentence from others even though referring the information with a citation in the U.S. is considered as plagiarism; and the report will get an F. The student also should not copy any report from previous students. If this is a case, the student will get an F. We will be using "iThenticate" software to look for plagiarism in each report/homework. Students can also use free plagiarism software like Plagiarisma.

Lab Safety Training: Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., through the following August) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned.

Electronic Communication: UT Arlington has adopted Mav-Mail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a Mav-Mail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using Mav-Mail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Campus Carry: Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

Student Feedback Survey: At the end of each term, students enrolled in face-to-face and online classes categorized as "lecture," "seminar," or "laboratory" are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback via the SFS database is aggregated with that of other students enrolled in the course. Students' anonymity will be protected to the extent that the law allows. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.

Student Support Services Available: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Final Review Week: for semester-long courses, a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no

scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](#), [major-based learning centers](#), developmental education, [advising and mentoring](#), personal counseling, and [federally funded programs](#). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

University Tutorial & Supplemental Instruction (Ransom Hall 205): UTSI offers a variety of academic support services for undergraduate students, including: 60 minute one-on-one tutoring sessions, Start Strong Freshman tutoring program, and Supplemental Instruction. Office hours are Monday-Friday 8:00am-5:00pm. For more information visit www.uta.edu/utsi or call 817-272-2617.

The IDEAS Center: The IDEAS Center (2nd Floor of Central Library) offers FREE tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. Students can drop in, or check the schedule of available peer tutors at www.uta.edu/IDEAS, or call (817) 272-6593.

The English Writing Center (411LIBR): The Writing Center offers FREE tutoring in 15-, 30-, 45-, and 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Register and make appointments online at <https://uta.mywconline.com>. Classroom visits, workshops, and specialized services for graduate students and faculty are also available. Please see www.uta.edu/owl for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation. <http://library.uta.edu/academic-plaza>.

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911.

Useful Links:

Library Home Page.....	http://www.uta.edu/library
Subject Guides	http://libguides.uta.edu
Subject Librarians	http://www.uta.edu/library/help/subject-librarians.php
Database List	http://www.uta.edu/library/databases/index.php
Course Reserves.....	http://pulse.uta.edu/vwebv/enterCourseReserve.do
Library Tutorials	http://www.uta.edu/library/help/tutorials.php
Connecting from Off- Campus	http://libguides.uta.edu/offcampus
Ask A Librarian	http://ask.uta.edu

The following URL houses a page where we have gathered many commonly used resources needed by students in online courses: <http://www.uta.edu/library/services/distance.php>.

The subject librarian for your area can work with you to build a customized course page to support your class if you wish. For examples, visit <http://libguides.uta.edu/os> and <http://libguides.uta.edu/pols2311fm>. If you have any questions, please feel free to contact Suzanne Beckett, at sbeckett@uta.edu or at 817.272.0923

Lab safety protocol: Use of gloves while handling chemicals or lab equipment is mandatory. Chemical experiments involving organic solvents are to be conducted in the fume hood only.

Cleanliness and hygiene: Students are responsible for cleaning their work benches, glassware and proper disposal of plastic-ware, gloves, tissues etc. Failure to abide by these rules will result in loss of points for the student and their respective group.

OUTLINE OF TOPICS COVERED (Dates may be subject to change)

Date	By instructor	By student
Aug 24	Introduction Equipment & Excel training Lecture: Nano/micro-particles and hydrogels for drug delivery	- Pass online safety requirements
Aug 31	Lab 1: Coumarin-6 loaded PLGA MPs Lecture: What is a drug standard curve? How will the standards be prepared?	- Synthesize lab 1 PLGA MPs
Sept 7	Lab 2: Synthesis of Alginate microparticles (MPs) Lab 3: Synthesis of Chitosan (pH sensitive) MPs	- Formulate alginate and chitosan microparticles
Sept 14	Begin drug release studies Lecture: How to perform drug release and loading efficiency calculations?	- Start drug release studies for lab 1, lab 2 and lab 3 particles - measure sizes of the microparticles

Sept 17 1 pm to 4 pm	Continue lab 1, 2 and 3	Collect drug release samples for day 3
Sept 21	Lab 1, 2, & 3: continued	<ul style="list-style-type: none"> - Continue collecting drug release samples (7 day) - Make BSA and coumarin 6 standards - Perform loading efficiency study
Sept 28	Continue labs 1, 2 and 3 Bradford assays	<ul style="list-style-type: none"> - Collect drug release samples for labs 1,2,3 (14 day) - Perform drug release calculations
Oct 5	Lab 4: PEGDA hydrogel synthesized by chemical-crosslinking and photo-crosslinking	- Formulate BSA loaded PEGDA hydrogel
Oct 12	Continue lab 4	<ul style="list-style-type: none"> - Start and finish drug release from PEGDA hydrogels - Turn in report 1 (lab 1, 2 and 3)
Oct 19	Final project protocols	- Turn in the experiment design and protocols for final projects (group grade: one per group)
Oct 26	Class presentation	- Present a research paper related to your final experiment or a research paper that helps you to select your final experiment. Discuss what you propose to do in your final project.
Oct 26	Continue lab 4	Calculate drug release from lab 4
Nov 2	Final project	- Work on final experiment
Nov 9	Final project	<ul style="list-style-type: none"> - Work on final experiment - Turn in report 2 (lab 4)
Nov 16	Final project	- Work on final experiment
Nov 23	No Class, Thanksgiving holiday	Thanksgiving holiday
Nov 30	Final project	Work on final experiment
Dec 7	Final project	<ul style="list-style-type: none"> - Final presentation - Submit final report

***Students can work on their final experiments during class hours only (Fridays 9 am to 11:50 am only). Working outside of these hours requires prior permission from the TA.**

“As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. –KTN”

IMPORTANT DEADLINES (due to TA before 9 am on the designated date; no exceptions will be made for the time, unless prior permission has been acquired from Dr. Nguyen. Late reports will receive a 50% score penalty)

No.	Deadline	Due Date
1	Lab Report 1 due (includes Labs 1, 2 and 3)	Oct 19
2	Turn in the design and protocols for final experiments	Oct 19
3	Presentation 1	Oct 26
4	Lab report 2 due (Lab 4)	Nov 9
5	Presentation 2 – Present your final experiment	Dec 7
6	Final Report due	Dec 7

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