# BE 5372-004 (80230): Drug Delivery
Fall 2014

**Instructor(s):** Kytai Truong Nguyen

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**Office Hours:** Tuesdays; 2:30-3:30pm

**TA:** Nikhil Pandey; **Email:** bmes5372@gmail.com

**Office Hours**: 2.00 – 3.00 PM; Monday and Friday.

**Section Information:** BE 5372-004 (80230), Drug Delivery

**Time and Place of Class Meetings:** ERB 130, Tuesdays and Thursdays, 3:30PM - 4:50PM

**Description of Course Content:** This class will introduce students to the concept of drug delivery systems that provide pharmaceutical agents at target tissues, the mechanism of pharmacokinetic regulation, the basics, technology, and applications of drug delivery systems. The emphasis is on understanding the principles of pharmacokinetics and drug delivery systems to improve clinical efficacy as well as to reduce side effects and on realizing the importance of the field, drug delivery.

**Student Learning Outcomes:** Midterm exam, homework, project, and final exam are applied for measuring the student learning outcomes in the long-term. In addition, questions will be given in each lecture, and student participation will be used to measure student learning outcomes. Lectures will then be adjusted accordingly to facilitate student learning.

**Required Textbooks and Other Course Materials:** Recommended not required. First two books are placed in Science and Engineering Library Reserve:
1. *Drug delivery systems.* Editors: Ranade VV, Hollinger MA. CRC Press.
2. *Drug delivery – Engineering principles for drug therapy*
   Editor: Saltzman WM. Oxford University Press.
3. *Drug delivery and targeting for pharmacists and pharmaceutical scientists* - Electronic resource book accessed via http://pulse.uta.edu/vwebv/
   Editors: Hillery AM, Lloyd AW, and Swarbrick J. Taylor & Francis Inc.

**Access to the class information:** Students can access class information including class syllabus and project samples on website: ftp://students.uta.edu, username: uta/netid, and password: netid password. Students need to sign in, and then click on the class folder to find be5372 folder for this class's documents. All lectures, homework samples, presentation samples, report samples, and some related articles are included in the class folder

**Descriptions of major assignments and examinations:** Students are expected to attend lectures, read and understand all handouts. Students are also expected to participate in discussions of problems and case studies presented during lecture periods. Verbal and written reports are required to develop communication skills for undergraduate and graduate students. ***Students are expected to work independently on exams and projects.***

For the project, students will choose a topic related to drug delivery systems, which must be approved by the instructor, and be required to present their projects in class in addition to the written report (10-15 pages). Format of oral presentation and written report is similar to the proposal type. For the report of your project, it should include background introduction, your research topic, a problem that you work on, your strategy to solve this problem, how you assess your strategy to determine whether it will work, limitations of your strategy and alternatives if possible. For presentation of your project, each presentation will be of 12 minutes in addition to 3 minutes for questions and discussion (see sample grading sheet). Grading of presentation will be based on the RA (25%), the TA (25%), and instructor (50%).

Late turn-in homework and project reports will be returned without a score (i.e. it will have a score of 0%). Students should refer to the class schedule at the end of this handout for all due dates. **There will be no make-up given for missed exams, unless the reason is explained with an accompanying document.**

Homework will be given to the students whenever necessary to help students understand the subjects. For the ethical homework, students need to find an ethical case related to drug delivery using web search and/or journal search and then discuss/debate about their cases with their classmates in the assigned lecture. The TA will monitor the discussion for this ethical class. Other homework assignments involve with articles related to the class topics. Students need to select an article related to one of class topics as specified later and write a report based on this article; for example, students should write about how the authors formed nanoparticles, how they tested their nanoparticles, major results from their tests, and limitations/problems if any in the article.

**Attendance:** At The University of Texas at Arlington, taking attendance is not required. Rather, 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*.

**Other Requirements:** Students should have some biomaterials background.

**Grading**:

**COURSE ASSESSMENT**

| | |
|---|---|
| **Midterm exam** | **25%** |
| **Project Presentation** | **20%** |
| **Final exam** | **25%** |
| **Homework** | **20%** |
| **Participation** | **10%** |

**EVALUATION OF STUDENTS**

| | |
|---|---|
| **A** | **85-100%** |
| **B** | **75-85%** |
| **C** | **65-75%** |
| **D** | **50-65%** |
| **F** | **Below 50%** |

**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, etc.

**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 more guidance see: http://catalog.uta.edu/academicregulations/grades/#graduatetext.

**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/aao/fao/).

**Americans with Disabilities Act:** The University of Texas at 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)*. 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 that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

**Title IX:** The University of Texas at Arlington is committed to upholding U.S. Federal Law “Title IX” such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

**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 as they see fit in their courses, including (but not limited to)having students acknowledge the honor code as part ofan examination or requiring students toincorporate 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.

**Electronic Communication:** UT Arlington has adopted MavMail 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 MavMail 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 MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

**Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as “lecture,” “seminar,” or “laboratory” shall be 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 enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT

Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

**Final Review Week:** 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 www.uta.edu/resources.

**Writing Center :** The Writing Center, 411 Central Library, offers individual 40 minute sessions to review assignments, *Quick Hits* (5-10 minute quick answers to questions), and workshops on grammar and specific writing projects. Visit https://uta.mywconline.com/ to register and make appointments. For hours, information about the writing workshops we offer, scheduling a classroom visit, and descriptions of the services we offer undergraduates, graduate students, and faculty members, please visit our website at www.uta.edu/owl/

**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:**

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| 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

**Course Schedule**
**(Dates may be subject to change)**

| Date | Topics | Presenters |
|---|---|---|
| 8/21/2014 | Introduction | Dr. Kytai T. Nguyen |
| 8/26/2014 | Library search for papers and patents | Silvia George Williams |
| 8/28/2014 | Basic concepts in drug delivery | Dr. Kytai T. Nguyen |
| 9/2/2014 | Polymers in controlled drug delivery | Dr. Kytai T. Nguyen |
| 9/4/2014 | Nanoparticles in drug delivery | Nikhil Pandey |
| 9/9/2014 | Controlled drug delivery systems | Nikhil Pandey |
| 9/11/2014 | Characterization techniques | Nikhil Pandey |
| 9/16/2014 | Traditional oral drug delivery | Nikhil Pandey |
| 9/18/2014 | Implant drug delivery | Dr. Kytai T. Nguyen |
| 9/23/2014 | Drug modification | Nikhil Pandey |
| 9/25/2014 | Transdermal drug delivery | Nikhil Pandey |
| 9/30/2014 | **Midterm Exam** | Dr. Kytai T. Nguyen |
| 10/2/2014 | Nasal and pulmonary drug delivery | Nikhil Pandey |
| 10/7/2014 | **Project presentation** | Dr. Kytai T. Nguyen |
| 10/9/2014 | **Project presentation** | Dr. Kytai T. Nguyen |
| 10/14/2014 | **Project presentation** | Dr. Kytai T. Nguyen |
| 10/16/2014 | **Project presentation** | Dr. Kytai T. Nguyen |
| 10/21/2014 | **Project presentation** | Dr. Kytai T. Nguyen |
| 10/23/2014 | Discussion of Ethical Cases | BMES/Students |
| 10/28/2014 | **Project presentation** | Dr. Kytai T. Nguyen |
| 10/30/2014 | Stimulated drug delivery | Nikhil Pandey |
| 11/4/2014 | Protein delivery | Nikhil Pandey |
| 11/6/2014 | Gene delivery/therapy | Dr. Kytai T. Nguyen |
| 11/11/2014 | Review math including differential equations | Dr. Kytai T. Nguyen |
| 11/13/2014 | Design of drug delivery systems – simulation | Dr. Kytai T. Nguyen |
| 11/18/2014 | Design of drug delivery systems – case studies | Dr. Kytai T. Nguyen |
| 11/20/2014 | MEMS for drug delivery | Dr. Kytai T. Nguyen |
| 11/25/2014 | Biological applications of drug delivery systems | Dr. Kytai T. Nguyen |
| 11/27/2014 | **Thanksgiving Holiday** | No class |
| 12/2/2014 | Future of drug delivery. FDA regulation involved with drug delivery | Dr. Kytai T. Nguyen |
| 12/9/2014 | **Final exam - Submission of final reports** | Dr. Kytai T. Nguyen |

## IMPORTANT DEADLINES FOR HOMEWORKS

| **Homework No.** | Write a summary/review report on **A RESEARCH ARTICLE** on following topics : | **Due Date** |
|---|---|---|
| 1 | Microparticles/Nanoparticles for targeted and controlled drug delivery | **Sept 11** |
| 2 | Implant drug delivery systems | **Sept 23** |
| 3 | Pulmonary drug delivery | **Oct 7** |
| 4 | An ethical case in drug delivery. **Turn in and discuss in class** | **Oct 23** |
| 5 | Stimuli-responsive drug delivery systems | **Nov 4** |
| 6 | Carriers for protein and/or gene delivery | **Nov 11** |
| 7 | Hydrogels/microparticles/nanoparticles for tissue engineering applications | **Nov 25** |

Your summary **MUST** be a maximum 2-page review containing:

1. A brief summary of Introduction, Materials and Methods, Results and discussions of the research article (**This has to be a research paper, not a review paper**).
2. Your critique on the work presented in the research article such as its strengths, weaknesses and possible improvements in any area.