

BE4331/5331-006

Course title: Polymers in Biomedical Engineering

Instructor: Dr. Yi Hong,

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Fall 2016;

Time: Monday and Wednesday 2:00 PM – 3:20PM

Room: ERB 131

Office hour: by appointment

Course description: Polymeric biomaterials for biomedical use, especially in tissue engineering/regenerative medicine, have gained increasing interest during the past decade. Such materials include synthetic polymers, natural polymers, micro-/nano-composite polymers, and biologically oriented synthetic polymers. The course will provide students with a solid foundation in polymeric biomaterial design, synthesis, characterization, processing, and their biomedical applications. The topics include theory of polymer chemistry and physics, polymeric biomaterials design, surface-engineering of polymeric biomaterials, functionalization of polymeric biomaterials, characterization of polymeric biomaterials, micro- and nano-fabrication of polymeric biomaterials, cell/tissue-polymeric biomaterial interactions, and the biomedical applications of polymeric biomaterials in cardiovascular, neural, musculoskeletal engineering, orthopaedic device, drug delivery, and gene therapy. This course is open to students from all departments in college of engineering and college of science.

- Theory of polymer chemistry and physics
- Synthetic polymers;
- Natural polymers
- Biologically oriented synthetic polymers
- Advanced biomaterials design
- Surface engineering of polymeric biomaterials
- Functionalization of polymeric biomaterials
- Micro/nano fabrication of polymeric biomaterials
- Cell/tissue-Biomaterials interaction
- Biomedical applications of polymeric biomaterials

Course Outcomes:

- 1) Students should be able to understand the basic principles and features of polymeric materials, identify and understand key structure-property-processing relationship of polymers;
- 2) Students should understand the roles of the polymer design play in the biomedical applications;
- 3) Students should be able to master the trend of polymeric biomaterials and communicate with the people in the field;

- 4) This course should help students to build up a good connection between their previous background and the use and design of the contemporary polymeric biomaterial.
- 5) Students will gain proficiency in scientific presentation.

Reference Books:

- Biomaterials. The Intersection of Biology and Materials Science. JS Temenoff, AG Mikos. 2008 Pearson Prentice Hall (UTA Bookstore)
- **Seymour/Carraher's Polymer Chemistry 6th ed**, 2003. by [Seymour, Raymond Benedict](#), [Carraher, Charles E.](#) (online available, reserved book in S&E library).
- [Biomaterials science : an introduction to materials in medicine / edited by Buddy D. Ratner ... \[et al.\]](#). Call Number: R857.M3 B5735
- [Biomaterials and tissue engineering / \[edited by\] Donglu Shi](#). Berlin ; New York : Springer-Verlag Berlin Heidelberg, 2004 Call Number: R857.M3 B56855
- [Biomaterials in design and reliability of medical devices \[electronic resource\] / \[edited by\] Michael N. Helmus](#). Georgetown, Tex. : Landes Bioscience ; Austin, Tex. : Eurekah.com, c2002 (online available) online available
- [Biomaterials, artificial organs and tissue engineering / edited by Larry L. Hench and Julian R. Jones](#) Boca Raton : CRC Press ; Cambridge : Woodhead, 2005 Call Number: R857.M3 B46
- [Biomaterials / Sujata V. Bhat](#). Harrow : Alpha Science International, c2004 2nd ed. Call Number: [R857.M3 B43 2005](#)
- [Polymeric Biomaterials: Polymer Implants \(New Concepts in Polymer Science\)](#) by **M. I. Shtilman (Hardcover - Aug 2003)**

Journals:

Biomaterials,
Acta Biomaterialia
Biomacromolecules
Journal of Biomedical Materials Research Part A, B
Tissue Engineering Part A, B, C
Journal of Controlled Release
Advanced Healthcare Materials
Nature Materials
ACS Biomaterial Science and Engineering

Teaching Assistant

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Lecture notes

No book is required. Notes will be uploaded to UTA Blackboard. Students are expected to make additional class notes by themselves. Also the class announcement will be published to all students through UTA blackboard.

Attendance Policy:

Student should attend the class as much as he/she can as the attendance will be given at 10% of students' grading. If the student does not attend the class without rational excuse, the credit will be reduced for 1 credit/each class until 10 credits gone.

Homework, Exams and Grading

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|---|-----|
| • Attendance | 10% |
| • Homework (4 times) | 30% |
| • Mid exam (TBD) | 20% |
| • Final exam (TBD, 2:00-3:20 pm, in class exam) | 20% |
| • Presentation (10 min presentation) | 20% |

The final grading will be A, B, C, D, and F (Fail). The final score above and equal to the average score (AS) will be graded as A. The score between AS and AS-10 will be graded as B, AS-10 to AS-20 will be graded as C, AS-20 to AS-30: D and AS-30 to AS-40: F. The final grade is not negotiable except for the score calculation problem. The temporary class schedule is attached at the end of the syllabus, but it is not final. The instructor may modify the schedule in terms of the class progress.

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. Contact the Financial Aid Office for more information.

Academic Integrity: It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. According to the UT System Regents' Rule 50101, §2.2, "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts."

Student Support Services Available: The University of Texas at Arlington has established a variety of programs to help students meet the challenges of college life. Support to students includes advising, counseling, mentoring, tutoring, supplemental instruction, and writing assistance. For a complete list of academic support services, visit the Academic Assistance resource page of the Office of Student Success Programs,

"<http://www.uta.edu/uac/studentsuccess/academic-assistance>". To help students address personal, academic and career concerns, individual counseling is also available. For more information, students are encouraged to contact Counseling Services "<http://www.counseling.uta.edu/>" at (817) 272-3671 or visit a counselor in 216 Davis Hall.

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>. *Students are responsible for checking their MavMail regularly.*

Americans with Disabilities Act:

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled *Americans with Disabilities Act (ADA)*, pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens. As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.uta.edu/disability. Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

Academic Dishonesty:

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection, 3.2, Subdivision 3.22)

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>.

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.

STATEMENT ON ETHICS, PROFESSIONALISM, AND CONDUCT FOR ENGINEERING STUDENTS

Students need to sign

Class schedule

This attached schedule is temporary setup as a reference. The schedule will be modified in terms of the exact class progress. The instructor has the right to change it, but will let the student know early.

Week	class date	Topic	presentation	homework
1	8/29/16	Class introduction (syllabus)		
	8/31/16	Class introduction		
2	9/5/16	No class (labor day)		
	9/7/16	Class introduction		1 st homework assignment
3	9/12/16	PMBE2: Polymer chemistry (Basic)		
	9/14/16	PMBE2: Polymer chemistry (Basic)		
4	9/19/16	PMBE2: Polymer chemistry (Basic)		
	9/21/16	PMBE3: Polymer chemistry (Molecular weight, chemical structure)		
5	9/26/16	PMBE3: Polymer chemistry (Molecular weight, chemical structure)		
	9/28/16	PMBE3: Polymer chemistry (Molecular weight, chemical structure)		
6	10/3/16	PMBE3: Polymer chemistry (Molecular weight, chemical structure)	2	
	10/5/16	Cancelled (BMES conference)		
7	10/10/16	PMBE4: Polymer chemsity (polymerization method)	2	
	10/12/16	PMBE4: Polymer chemsity (polymerization method)	2	
8	10/17/16	PMBE4: Polymer chemsity (polymerization method)	2	2rd HW
	10/19/16	PMBE5: Nonvinyl polymers	2	
9	10/24/16	PMBE5: Nonvinyl polymers	2	
	10/26/16	Midterm exam (cover: introduction to PMBE 4)	2	
10	10/31/16	PMBE5: Nonvinyl polymers	2	
	11/3/16	PMBE6: Polymer characterization	2	
11	11/7/16	PMBE6: Polymer characterization	2	
	11/9/16	PMBE6: Polymer characterization	2	3rd HW
12	11/14/16	PMBE7: Host response of biomaterials	2	
	11/16/16	PMBE7: Host response of biomaterials	2	
13	11/21/16	PMBE7: Host response of biomaterials	2	
	11/23/16	PMBE8: Natural polymers	2	
14	11/28/16	PMBE8: Natural polymers	2	
	11/30/16	PMBE8: Natural polymers	2	4th HW
15	12/5/16	Final review week (Presentation completetion, 4th homework)	3	
	12/7/16	Final review week (Presentation completetion, 4th homework)	2	
	12/10/16-12/16	final exam week (Final exam: cover PMBE5-8)	Date will set up later	