

Course Syllabus

MSEC 7340 – Biomaterials and Biosensors

Instructor: Dr. Tania Betancourt
Email Address: TB26@txstate.edu
Office Location: CENT 340D
Office Phone: (512) 245-7703
Office Hours: TR 3:30 – 4:30 PM or by appointment

Instructor: Dr. Shannon Weigum
Email Address: sweigum@txstate.edu
Office Location: SUPP 142
Office Phone: (512) 245-1774
Office Hours: TR 3:30 – 4:30 PM or by appointment

Lecture Time and Location:
TR 2:00 – 3:20 PM
SUPP 153A

Objectives: The goal of this course is to provide a detailed background on the design, function, characterization, and evaluation of materials and sensors used in biomedical applications.

At the end of this course, students will be able to:

- Identify the design features that must be considered for development of a biomaterial or biosensor
- Understand the specific properties of biomaterials and methods for biomaterial characterization
- Understand typical physiological response to biomaterials
- Recognize the types and properties of different classes of biomaterials including polymers, hydrogels, nanomaterials, and inorganic materials
- Be familiar with various applications of biomaterials in the fields of drug delivery, bioimaging, tissue engineering, cardiovascular disease, wound healing, extracorporeal devices, and biosensing among other areas.
- Understand the development, regulation, ethical, and legal aspects of biomaterials

Resources:

No textbook has been assigned for this course. However, material from selected texts and articles from the literature will be used during the course. The following are recommended reference textbooks:

- Biomaterials Science: An Introduction to Materials in Medicine, 3rd Ed.
Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, and Jack E. Lemons, Eds.
Elsevier / Academic Press, Canada, 2013
Ebook: <http://catalog.library.txstate.edu/record=b2384772~S1a>
Hard Copy: Circulation Reserve Desk, Floor 2, Call No. R857.M3 B5735 2013
2nd Edition of this book also available at library: Call No. R857.M3 B5735 2004
- Biomaterials Science: An Integrated Clinical and Engineering Approach
Yatzhak Rosen and Noel Elman, Eds.
CRC Press, Boca Raton, FL 2012
Ebook: <http://catalog.library.txstate.edu/record=b2214167~S1a>
- Comprehensive Biomaterials, Volume 1
Paul Ducheyne, Kevin E. Healy, Dietmar W. Hutmacher, David W. Grainger, and C. James Kirkpatrick, Eds.
Elsevier, Italy, 2011
ISBN: 978-0-08-055302-3
Available from google books:
<http://books.google.com/books?id=oa8YpRsD1kkC&printsec=frontcover#v=onepage&q&f=false>

- Characterization of Biomaterials
Amit Bandhyopadhy and Susmita Bose, Eds.
Elsevier, 2013
Available from campus at: www.sciencedirect.com/science/book/9780124158009
- Encyclopedia of biomedical polymers and polymeric materials
Munmaya Mishra, Ed.
CRC Press
2015
Available on campus at: <http://catalog.library.txstate.edu.libproxy.txstate.edu/record=b2829297~S1a>
- Chemical sensors and biosensors: fundamental and applications
by Brian R. Eggins
Publisher: Chichester, West Sussex, United Kingdom : Wiley, 2012.
Call No.: TP159.C46 B36 2012
URL: <http://catalog.library.txstate.edu/record=b2393838~S1a>
This book is on reserve at the library but is NOT available as an eBook.
- Chemical sensors and biosensors
by Brian R. Eggins
Publisher: Chichester ; Hoboken, N.J. : J. Wiley, c2002.
Call No.: TP159.C46 E44 2002 E-book
URL: <http://catalog.library.txstate.edu/record=b1926742~S4a>

TRACS: A TRACS site will be used for this course. You will need a valid Texas State University user ID and password to access TRACS. For help with ID and password visit <http://www.tr.txstate.edu/itac/netid.html>. You can access TRACS at <https://tracs.txstate.edu/portal/login> or from the link on the Texas State University homepage. Once you log in, this course should appear listed near the top of the screen by “My Workspace” or in “My Active Sites.” **Course information, notes, announcements, and other important documents will be placed on the TRACS site.**

Attendance: You are expected to attend the lecture every day and on time. **If you know that you need to come in late or leave early, let your professor know ahead of time** and arrange so that you cause the least amount of distraction to your classmates.

Exams: Under normal circumstances, there will be no make-up exams. In the event that you must miss an exam due to a valid excuse (as defined by the university), **contact the professor prior to the exam time** by phone or email to discuss your situation. Proof of valid excuse will be required, including but not limited to a medical certificate.

In-class Presentations:

Students will be required to select a primary literature article, recently published in the field of biosensors and biomaterials research, and lead an in-class discussion regarding the paper’s goals, key research findings, significance, and future outlook. Appropriate introduction/background information/methods description from other literature sources should be included in the presentation to supplement the discussion with proper scientific citations. Discussion of the importance and/or connection to ongoing research at Texas State is highly desirable. Presentations should be approximately 40 minutes in length and delivered via PowerPoint or equivalent. Literature articles and slides must be uploaded by the student onto TRACS at least 24 hrs. prior to each presentation.

White Paper: Students will write a one-page white paper that provides an overview of their proposed thesis/dissertation research following NIH proposal instructions (PHS 398) for the “Specific Aims” section. This will include a statement of the research goals, expected outcomes, and impact/significance of the proposed research.

Extra Credit: Students will have the opportunity to earn *5 points of extra credit toward their overall course grade* for attending one full-day conference or five one-hour seminars related to biomaterials and/or biosensors. Conferences listed on the schedule below are all acceptable for extra credit. Conferences/seminars not listed will need to be approved by at least one of the instructors prior to the conference date in order to receive extra credit.

Grading:

	Percent	Notes
Exam 1	25 %	Biosensors: Lectures 1-8
Exam 2	25 %	Biomaterials: Lectures 9-16
Research presentation	20 %	Selected topics
Research white paper	20 %	Overview of proposed thesis/dissertation research
Participation	10 %	In-class attendance and thoughtful discussion

The professors reserve the right to change the number of and net weight of exams, as well as the content of each exam. Any changes in the grading scale will be communicated during class and via email.

The grading scale on the right-side table will be followed. The professors reserve the right to adjust the grading scales at the end of the course.

Percent	Grade
90 – 100 %	A
80 – 89 %	B
70 – 79 %	C
60 – 69 %	D
Below 60 %	F

Academic Dishonesty:

It is expected that each student will uphold the Texas State University Academic Honor Code detailed in the student handbook (<http://www.txstate.edu/effective/upps/upps-07-10-01-att1.html>). Cheating or plagiarism will not be tolerated. All students involved will be subject to penalty according to the honor code. Evidence of cheating or plagiarism will result in a grade of “0” for that quiz/exam/assignment.

It is essential for each student to learn and understand the material thoroughly and practice honesty to prepare him/her for quizzes, exams, later courses, their professional life, and life as a whole.

Drop Policy:

You may drop this class and obtain a 100% refund by midnight **September 9, 2015**. No refunds will be given after this date. You can drop this class and obtain an automatic “W” grade any time prior to **October 25, 2015, at 5 pm**. If you need to withdraw from the university (drop to zero hours), you may do so by **November 19, 2015**. Students who need to withdraw between the Automatic W deadline and the last day to withdraw must speak with the instructor to discuss their grade (W or F).

MSEC 7340 – Biomaterials and Biosensors Tentative Schedule – Fall 2015

Week	Date	Topic/Exams	Available Conferences and Seminars
1	August 25 August 27	Introduction to biosensors Enzymes and catalytic sensors	Materials Research Day @ UTSA Aug 24 th San Antonio, TX Society for Biomaterials webinar “Starting a Biomaterials Company”, August 25 th , https://attendee.gotowebinar.com/register/6490140430292571393
2	September 1 September 3	Affinity-based sensors – part 1 Affinity-based sensors – part 2	
3	September 8 September 10	Optical transduction and detection Electrochemical transduction methods	
4	September 15 September 17	Microfabrication techniques/MEMS Performance factors and FDA approval	Chemistry Seminar, Nick Carroll, Duke University, Sept. 14 th , 2 pm, CHEM 100
5	September 22 September 24	Exam 1 How to write the “Specific Aims”	
6	September 29 October 1	Introduction to biomaterials Polymeric Biomaterials	
7	October 6 October 8	Polymeric Biomaterials <i>Independent work on White Paper assignment (class does not meet during this time)</i>	Chemistry Seminar, James Tunnell, UT Austin, Oct 5 th , 2 pm, CHEM 100 BMES 2015 Oct 7-10 th Tampa, FL
8	October 13 October 15	Biodegradable Materials Biodegradable Materials / Drug Delivery Systems	
9	October 20 October 22	Drug Delivery Systems / Nanomedicine Nanomedicine / Hydrogels	
10	October 27 October 29	Hydrogels <i>Independent work on White Paper assignment (class does not meet during this time)</i>	
11	November 3 November 5	<i>Independent work on White Paper or Student Presentation assignment (class does not meet during this time)</i>	
12	November 10 November 12	Tissue Engineering / Biomaterial Evaluation / Regulatory Aspects Exam	
13	November 17 November 19	Student Presentation Student Presentation	Cally Moore/Lichen Xiang Zhenyuan Lu/Liz McIvor
14	November 24 November 26	Student Presentation <i>Thanksgiving Break</i>	Chris Munoz/Aditya Ranjan
15	December 1 December 3	Student presentations Student Presentation	Katie Kendrick/Sara Robertson Tugba Ozel/Karolyn Barker
16	December 8	Research White Paper Due (Final Exam)	