

**BE 4314/5314: Biomedical Implants**  
Spring 2018

**Instructor(s):** Jun Liao

**Office Number:** ERB 353

**Office Telephone Number:** 817-272-6779

**Email Address:** [jun.liao@uta.edu](mailto:jun.liao@uta.edu)

**Faculty Profile:** <https://mentis.uta.edu/explore/profile/jun-liao>

**Office Hours:** Monday 11:00 AM – 12:00 PM (by appointment)

**Section Information:** 4314/5314-011

**Time and Place of Class Meetings:** 1:00 PM – 2:20 PM on Monday and Wednesdays; Woolf Hall, Room 308 (WH 308)

**Description of Course Content:** This comprehensive course covers the essential knowledge in biomedical implants. Our goal is to provide the students with knowledge and skills in understanding the medical need, engineering principles in implant design, host-implant interaction, engineering restrictions and non-engineering restrictions in design optimization, and implant performance/clinical outcome assessments. Case studies include mechanical, bioprosthetic and transcatheter heart valves, vascular grafts, stents, pacemakers, orthopedic implants, dental implants, etc. In this course, we also cover the regulatory knowledge such as patent protection, design validation in animal models and clinical trials, IACUC, IRB, Good Manufacture Practice (GMP), and FDA regulations and approvals.

Prerequisite: completed or concurrent BIOL 1442, MATH 3319, PHYS 1444.

**Student Learning Outcomes:** The students are expected to (i) understand and identify the medical needs for biomedical implants; (ii) have the essential knowledge of biomedical implants including engineering principles of biomedical implants, host-implant interaction, design procedure, design verification and validation, and performance assessments; (iii) be able to lead a project to design a biomedical implant; (iv) understand engineering restrictions and non-engineering restrictions, FDA regulations, patent, and commercialization issues related to biomedical implant industry; (iv) The students are expected to be able to apply the learned knowledge to solve problems in the rapidly growing field of biomedical engineering.

**Required Textbooks and Other Course Materials:** No required textbook. Lecture notes will be handed out in pdf. The covered content is adapted from the following biomedical books, current literatures in biomedical implants, medical devices, FDA regulations, etc.

- (1) J. D. Bronzino. "The Biomedical Engineering Handbook" (1999, CRC Press; 2nd edition).
- (2) M. Culjat, R. Singh, H. Lee. "Medical Devices: Surgical and Image-guided Technologies." (2013, Wiley Press; 1st edition).
- (3) P. H. King, R. C. Fries, A. T. Johnson. "Design of Biomedical Devices and Systems." (2014, CRC Press; 3rd edition).
- (4) T. Özel et al. "Medical Devices: Design, Prototyping, and Manufacturing." (2017, Wiley Press; 1st edition).
- (5) and others...

**Descriptions of major assignments and examinations:**

|  |     |
|--|-----|
| Attendance and Class Participation<br>(No tolerance: Absence without permission) | 15% |
| Homework   | 20% |

|  |             |
|--|-------------|
| Laboratory (1)   | 5%          |
| Projects (2 for undergraduates; 3 for graduate students) | 15%         |
| Midterm Exam   | 20%         |
| Final Exam   | 25%         |
| <b>Total</b>   | <b>100%</b> |

**Attendance:** 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 will take attendance weekly. 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.

**Grading:** Letter grading

A 90 —100

B 80 — 89

C 70 — 79

D 60 — 69

F below 60

\* numbers will be rounded to the nearest whole number: i.e., 89.4 = 89%, 89.6=90%

**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://www.uta.edu/aao/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](http://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](http://www.uta.edu/disability).

Counseling and Psychological Services (CAPS) [www.uta.edu/caps/](http://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](http://uta.edu/eos).

**Title IX Policy:** 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](http://www.uta.edu/titleIX) or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or [jmhood@uta.edu](mailto: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/>.

**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>.

**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.

**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, which is located on the east side of the room and exiting at the east side of the first floor. 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](mailto:resources@uta.edu), or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

## Course Schedule

*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.*

| Date          | Teaching Plan                   |  |
|---------------|---------------------------------|--|
| 01/17/2018    | Lecture 1                       |  |
| 01/22/2018    | Lecture 2                       |  |
| 01/24/2018    | Lecture 3                       |  |
| 01/29/2018    | Lecture 4                       |  |
| 01/31/2018    | Lecture 5                       |  |
| 02/05/2018    | Lecture 6                       |  |
| 02/07/2018    | Lecture 7                       |  |
| 02/12/2018    | Lecture 8                       |  |
| 02/14/2018    | Lecture 9                       |  |
| 02/19/2018    | Lecture 10                      |  |
| 02/21/2018    | Lecture 11                      |  |
| 02/26/2018    | Lecture 12                      |  |
| 02/28/2018    | Lecture 13                      |  |
| 03/05/2018    | Review for Midterm              |  |
| 03/07/2018    | Midterm Exam                    |  |
| 03/12/2018    | Spring Break                    |  |
| 03/14/2018    | Spring Break                    |  |
| 03/19/2018    | Laboratory                      |  |
| 03/21/2018    | Lecture 14                      |  |
| 03/26/2018    | Lecture 15                      |  |
| 03/28/2018    | Lecture 16                      |  |
| 04/02/2018    | Discuss of Major Design Project |  |
| 04/04/2018    | Lecture 17                      |  |
| 04/09/2018    | Lecture 18                      |  |
| 04/11/2018    | Lecture 19                      |  |
| 04/16/2018    | Lecture 20                      |  |
| 04/18/2018    | Lecture 21                      |  |
| 04/23/2018    | Lecture 22                      |  |
| 04/25/2018    | Lecture 23                      |  |
| 04/30/2018    | Lecture 24                      |  |
| 05/02/2018    | Review for Final Exam           |  |
| 05/07-11/2018 | Final Exam Week                 |  |

**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. Non-emergency number 817-272-3381