Tissue Engineering Laboratory
BE 5365/BIOL 4365
Spring 2020
Tuesday & Thursday
Online version

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Course Description: Introduction to laboratory techniques commonly used for designing and prototyping various products used in tissue engineering such as scaffolds and other medical devices, with a focus on the mechanisms and applications of 3D printing technology. The designing of tissue engineering products would be taught using Solidworks, one of the most popularly used software for computer aided 3D modelling.

Meeting Times: Tuesday & Thursday 9:30 – 10:50 am
Location: ERB 280

Course Learning Goals/Objectives: Students will learn the necessary skills required for proficiency with 3D modeling of scaffolds and medical devices in Solidworks. Students will be introduced to concepts of designing tissue engineering products. Students will learn basic Solidworks simulation technique to determine fluid flow mechanics and mechanical properties of scaffold and medical device designs. Students will become familiar with fundamental 3D printing software and its tissue engineering applications.

Course Evaluation & Final Grade:
- Assignments (7 out of 8): 40%
- Group Presentations 1 & 2 (12.5% each): 25%
- Final Presentation: 20%
- Participation/Attendance/bonus points: 15%

Overview of Course Components

Assignments: Will include both individual and group assignments. Assignments may be due before the end of lab or at a later class period. No late homework will be accepted.
Presentations: Three group presentations will be included on the subject of a scaffold design project. Presentations will be done in groups and will provide a summary of the labs and results of all topics covered.

For the “Group Presentation #2” and “Group Final Presentation”, the presentation narrative must be recorded as shown in the following link https://support.office.com/en-us/article/video-record-presentations-2570dff5-f81c-40bc-b404-e04e95ffab33. Final presentation ppt file must be submitted via Canvas by 6:00 PM the day of the presentation date. No late presentations will be accepted. More detail on the requirements will be given prior to the presentation dates. The presentation dates on the schedule have been highlighted in yellow.

Participation: All presentations will be posted on Canvas and opened for discussion for 7 days (highlighted in yellow). All of the students are required to view all presentation and to participate in discussion. Discussion participation is counted toward your final grade (Participation/Attendance/bonus points: 15%).

Course material: No textbook is required for this class. All protocols and course materials will be uploaded on Canvas. Students are encouraged to bring their own laptops with Solidworks installed. Go to: https://www.uta.edu/oit/cs/its/assets/pdf/software/SolidWorks-SDK-Detailed-Installation-Instructions-08-24-2018_blurred.pdf for the instructions to install Solidworks.

Laboratory Safety Training Required: Online at www.uta.edu/training. Login with UTA NetID and password.

Laboratory Schedule:

Section 1: Introduction to Solidworks

Jan 21 (Tue) : Course Introduction
Jan 23 (Thurs) : Introduction to Solidworks
Jan 28 (Tue) : Solidworks Beginner Functions
Assignment #1: Protocol submission & Solidworks tutorial 1
Jan 30 (Thurs) : Solidworks Intermediate Functions
Assignment #2: Protocol submission & Solidworks tutorial 2
Feb 4 (Tue) : Solidworks Advanced Functions
Assignment #3: Protocol submission & Solidworks tutorial 3
Feb 6 (Thurs) : Introduction to 3D Printing/Bioprinting

Section 2: Introduction to Device Design

Feb 11 (Tue) : Guided Design: Simple Part
Assignment #4: Part submission
Feb 13 (Thurs) : Guided Design: Simple Part for Assembly
Feb 18 (Tue) : Guided Design: Simple Part for Assembly Cont.

Feb 20 (Thurs) : Guided Design: Part Integration into Assembly

Assignment #5: Assembly submission

Feb 25 (Tue) : Introduction to Fablab

Feb 27 (Thurs) : Group Presentation #1: Device Assembly

Section 3: Scaffold Design

Mar 3 (Tue) : Device/scaffold Post-Processing

Mar 5 (Thurs) : Scaffold Design: Design Challenge

Assignment #6: Design challenge submission

Mar 9-15 Spring Break

Mar 24 (Tue) : Scaffold Design: Porosity

Mar 26 (Thurs) : Scaffold Design: Morphology

Section 4: Introduction to Simulation in Solidworks

Mar 31 (Tue) : Mini integrated Design Group Project: Scaffold/Device integration

Assignment #7: Design challenge submission

Apr 2 (Thurs) : Solidworks: Introduction to Fluid Simulation

Apr 7 (Tue) : Simulation Design Challenge: Flow Modelling

Apr 9 (Thurs) : Group Presentation #2 Submission (@ 6 pm): Mini Project/Final Project Design Progress

Apr 10 -16 : Presentation discussion.

Apr 14 (Tue) : Solidworks: Introduction to Mechanical Simulation

Apr 16 (Thurs) : Simulation Design Challenge: Mechanical Properties

Apr 21 (Tue) : Mini Integrated Design Group Project: Simulation

Assignment #8: Design challenge submission
Section 5: Final Project

Apr 23 (Thurs) : Final Project Design

Apr 28 (Tue) : Prototype presentation

Apr 30 (Thurs) : Final Printing

May 5 (Tue) : **Group Final Presentation Submission (@ 6 pm)**

May 6-12 : **Presentation discussion.**

May 12 (Tue) : Design improvement

May 14 (Thurs) : Design improvement

**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 93112 - The Rehabilitation Act of 1973 as amended. With the passage of new 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 accommodation* to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.

**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).