BIOEN 6220: BIOFLUID MECHANICS
Fall 2017 – Syllabus

Purpose: The overall purpose of this course is to develop competencies in fluid mechanics principles using practical examples and clinical case studies of how fluid mechanics knowledge is applied to biomedical applications.

Objectives: Following completion of the course, students will be able to:

1. understand fluid kinematics, including Eulerian v. Lagrangian approach, velocity, acceleration, vorticity, and deformation rate
2. characterize intrinsic fluid properties, including compressibility, viscosity, constitutive behavior, and rheology
3. derive mass and momentum balance relations, evaluate their simplifications, and interpret how these factors operate in biological systems
4. apply conservation laws to compute fluid flows, including velocity fields, pressure drops, shear rate/stress, for various biological systems
5. understand dimensional analysis, including non-dimensional numbers and similitude, and its application in experimental design
6. appreciate the significance of fluid mechanics in physiology, disease development, and treatment

Prerequisites: PHYS 2210, MATH 2250 (differential equations and linear algebra), and BIOEN 3301 or course(s) in computational methods; BIOEN 4250 (Biomechanics I) or course(s) in continuum mechanics are suggested, although not required. Undergraduate juniors or seniors who meet the prerequisites may enroll with instructor approval.

Lectures: M,W 11:50 – 1:10 pm; MEB 2475

Instructor: Lucas H. Timmins, Ph.D.
Office: MEB 2474
lucas.timmins@utah.edu

Office Hours: T, Th 11:00 – 12:00, MEB 2474; other times by appointment

TA: TBD

Web Page: Canvas

Textbook: There is not an official textbook for BIOEN 6220; however, class notes/handouts will be available to download from Canvas. There are several textbooks, which cover various course material, that will be on reserve at the Marriott Library. These textbooks include:


Grading: Homework (4 sets) 20% total
Exams (2) 40% total
Matlab project (see below) 15% total
Final exam (comprehensive) 25% total

Homework: Due at the beginning of lecture on specified day (see Course Schedule). No late homework will be accepted without a medical note.

Matlab Project: Although the majority of the class will focus on analytically solving transport problems, there will be one project report requiring MATLAB programming that counts toward 15% of your grade. The report must be submitted electronically to Canvas by the due date and time. You are expected to turn in independent project reports and not work in teams for this assignment.

Final Exam: The final exam date and time are scheduled by the Office of the Registrar and therefore are not flexible (see http://registrar.utah.edu/academic-calendars/Final-Exams-F17.pdf). The final exam for BIOEN 6220 for this semester is scheduled for Wednesday, December 13, 2017, 10:30 am – 12:30 pm.
Students are expected to attend all exams. Therefore, except for a University approved absence (Type I), which are explicitly listed in Policy 6-100.III.O, permission to be excused from an exam will only be granted for extremely unusual circumstances. All planned absences must be discussed in advance with the professor and supported by documentation. In the event of an unplanned absence (Type II), the reason for the absence must be communicated to the professor as soon as practically possible and documentary evidence is required (e.g., a doctor's note in the case of illness). Failure to provide evidence for the absences will result in a zero for that exam, with no exceptions.

Regrades: Regrade requests must be submitted within one week after return of the work in question. Challenges to grades given on homework assignments or exams should be submitted in writing, and include the specific challenge and original work in question. Note that all regrade requests will result in complete regrading of the item in question, and thus could result in the grade decreasing, increasing, or staying the same.

University Policies:

**Academic Misconduct.** The Department of Bioengineering has a zero tolerance policy for any form of academic misconduct. Students are expected to abide by the University of Utah Code of Student Rights and Responsibilities (see [http://regulations.utah.edu/academics/6-400.php](http://regulations.utah.edu/academics/6-400.php)). Academic misconduct, which includes cheating, misrepresenting one's work, inappropriately collaborating, plagiarizing, and fabrication of falsification of information, will not be tolerated. Any instances of academic misconduct will be immediately reported to the Department Chair, Associate Chair for Undergraduate Studies, and Dean of Students.

**The Americans with Disabilities Act.** The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

**Addressing Sexual Misconduct.** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).
Note that some topics will take somewhat less than one lecture to cover; others will require somewhat more than one lecture. The lecture schedule shown above is therefore approximate.