Biomedical Fundamentals

BME 3060 Section 02EH
Class Periods: Tuesday Period 8-9 (3:00 PM – 4:55 PM)
Thursday Period 9 (4:05 PM – 4:55 PM)
Location: Online only
Academic Term: Spring 2021

Instructor: Edward A. Phelps, Ph.D.
Email Address: ephelps@bme.ufl.edu
Office Hours: Thursdays, 5:00 PM – 6:00 PM, online only

Supervised Teaching Student (STS):
STSs are graduate students who will facilitate in-class learning exercises, homework sets, and some lectures. Please contact your STS through the Canvas website.

- Michele Dill, mdill@ufl.edu
- STS Office Hours: Wednesdays, 2:00 PM – 3:00 PM, online only

Course Description
Working specifically within the framework of biomedical engineering applications, provides the engineering fundamentals of the conservation laws of mass, energy, charge, and momentum.

Course Pre-Requisites / Co-Requisites
Prereq: CHM 2046 – General Chemistry 2 <u>or</u> CHM 2096 – Chemistry for Engineers 2
MAC 2313 – Analytic Geometry and Calculus 3
each with minimum grades of C.
Coreq: PHY 2049 – Physics with Calculus 2
MAP 2302 – Elementary Differential Equations
BME 1008 – Introduction to Biomedical Engineering

Course Objectives
The foundation of many biomedical engineering problems is based on conservation laws. The goals of this course are to develop problem-formulation and problem-solving skills, develop and understand conservation equations, and apply them to solve problems in biomedical engineering.

Professional Component (ABET):
This course prepares students to apply advanced mathematics to solve problems at the interface of engineering and biology.

Relation to Program Outcomes (ABET): The following ABET learning outcomes are emphasized in this course.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

***Required* Textbooks and Software**

Text: Bioengineering Fundamentals 2nd Edition, A. Saterbak, K. San, and L. McIntire, 2018. ISBN #9780134637433

You may use a hard copy or electronic copy of the text.
Please note that this course will be participating in the UF All Access program. Login at the following website and Opt-In to gain access to your required course materials
- https://www.bsd.ufl.edu/G1CO/IPay1f/start.aspx?TASK=INCLUDED – UF All Access will provide you with your required materials digitally at a reduced price and the ability to pay using your student account. This option will be available starting 1 week prior to the semester starting and ending 3 weeks after the first day of class.

Software: A means for solving systems of equations is required for completion of certain assignments (e.g. Matlab, graphing calculator, or Wolfram Alpha website)

Topics Covered in this Course:

- Approaching Problems from an Engineering Perspective
- Dimensional Analysis and Dimensionless Numbers
- Foundations of Engineering Calculations
- Conservation Principles
- Conservation of Mass
- Conservation of Energy
- Conservation of Charge
- Conservation of Momentum
- Applying Engineering Principles to Biological Systems

Course Schedule: The schedule is tentative and subject to change. See course website for official calendar.

Class Website:

- Canvas (elearning.ufl.edu) will be used extensively, including posting all assignments and grades.
- Each student is fully responsible for ensuring that they have access to Canvas and must check the course website routinely to ensure they are fully aware of all assignments and postings.
- Failure to check the course website will not be a valid excuse for not completing assignments.

Meeting Course Objectives:

Lectures:

- Lectures will follow the textbook. Other topics will be covered at the discretion of the instructor.
- Lectures will reinforce important concepts, outline derivations, and support completion of homework.
- Class attendance and individual note-taking is critical for success in this course.

Reading:

- Reading of assigned sections from the textbook and external resource material is required PRIOR to class.
- Assigned reading will serve as the basis for class discussion and lecture.
- In-class reading comprehension quizzes will be given for a grade.

In-class Assignments:

- In-class assignments, quizzes, and discussions will be provided to supplement and reinforce learning.
- Some in-class assignments will count for a grade, others will be for practice only.

Homework:

- Homework is to be completed individually.
- In general, you will be given 1.5 weeks to complete assignments from when they are posted on Canvas.
- Homework assignments are due precisely at the date and time indicated.

- No late homework is accepted. The submission window closes automatically at 11:59 PM.
- There is no grace period.
- Homework is ONLY turned in electronically via Canvas as a single PDF.
- No hard-copy homework is accepted.
- In the event of technical issues with the website please email your assignment to Dr. Phelps. Technical issues with online submission do not excuse late assignments.
- Illegible work will not be graded and counts as 0 pts.

Teamwork:
- You will be randomly assigned to a team to work with during the semester on in-class assignments.
- Teams will rotate periodically.

Exams:
- There will be four individual exams, each worth 14% of the final grade.
- There is no cumulative final exam.

Attendance Policy, Make-Up Policy, Class Expectations, and Assistance:

Attendance:
- Attendance is not monitored directly, but is essential for success in this course.
- There will be in-class only team quizzes for a grade
- It is your responsibility to keep up to date on the materials/assignments when you have missed class.
- Please notify Dr. Phelps in advance if you will be missing more than 2 consecutive classes.

'Life Happens' Policy:
- This policy does not apply to exams.
- Students are permitted one unexcused homework, no questions asked.
- Students are permitted one unexcused in-class team quiz, no questions asked.

Make-Up Assignment Policy:
- No late homework and no late in-class assignments are accepted.
- No make-up homework and no make-up in-class assignments are permitted.
- This policy is to ensure timely posting of solutions due to the fast pace of the class.
- See the **life-happens policy** which accounts for routine unexpected situations.
- Missed class due to official UF or professional travel (e.g. interview, scientific conference, etc.) must be arranged with the instructor in advance and will only be granted on an individual case-by-case basis. Any missed assignments must be submitted in advance.
- Extended university approved excused absences resulting in multiple missed assignments will be handled on a case-by-case basis.
- If you miss an exam or assignment because of circumstances related to the ongoing public emergency (e.g. you or a close family member is ill with COVID-19), I will work with you to overcome this setback. Please make efforts to obtain such documentation as is possible such as a doctor's note; I will do my best to adapt to your individual situation regardless of documentation.

Make-Up Exam Policy:
- Make up exams are permitted only for documented university approved excused absences.
- Please review your student handbook to ensure that you understand the requirements for a university approved absence. Excused absences are consistent with university policies and require appropriate documentation. (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx).

Communication:

- Class announcements will be posted to Canvas. All students are responsible for ensuring awareness of these postings. Failure to review the course website is not an excuse for missing announcements.
- Please use only your official UF email address to communicate with Dr. Phelps or your STS.
- Dr. Phelps prefers that you use Canvas when sending messages for automatic association with the class.
- Include BME 3060 in the subject line.
- Although he is usually faster, please allow up to 48 hours for Dr. Phelps to respond, longer if at night or on the weekend / holidays / breaks.

Professional conduct:

- Students are expected to engage with the instructor and fellow students in a courteous and professional manner. Online participation in the course is expected to be professional and on-topic.
- Peer-evaluation and feedback should be respectful and constructive.
- Any student who behaves in a disrespectful or disorderly manner may be asked to leave the classroom or online forum.

Assistance with Course Material:
You should expect this course to challenge you and require time, effort, and thoughtful analysis for success. When a concept or problem presents a challenge, spend the time to really think about how to approach the problem, as this thoughtful analysis will train you for success in exams (and future classes). If you are struggling with a concept or problem, you have 3 primary resources: 1) your peers, 2) your STS, and 3) your professor. Before you reach out to any of these resources, you are expected to have spent considerable time on your own attempting to understand or complete the problem.

Peers:
Establishing a strong and fruitful peer network is an important resource in your major and will help serve you well as you progress in BME, so seek out colleagues that can serve as a strong peer network. Brainstorming on problems with your peer group (after you have attempted to solve them independently) is permitted; however, this dynamic interaction should be one that leads to improved conceptual understanding on how to approach problems – not one used as a crutch to copy solutions. Assignments are used to train you for exams, so copying solutions from friends will inevitably result in a poor exam performance. In the end, individual assignments must be your own work, not a copied solution. All team members must participate in the collaborative assignments. See Plagiarism Policy.

STS/Professor:
The STS and professor are another resource to assist you in succeeding in this course. You are welcome to see the STS or Dr. Phelps during posted office hours. Due to multiple demands, we are typically unavailable outside of these times, but can be reached via email. Office hours are for answering questions focused on clarifying concepts or providing a new prospective on how to approach a problem, not for providing answers to problems or walking you through each problem. When notes are left on assignments and exams to "see me", this means that the professor or STS would like to take extra time to work out concepts with the student. Scheduling this time, however, is expected to be initiated by the student, otherwise the impression is given that the student is not willing to put in the extra effort to succeed in the course.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or STS in this class.

Plagiarism:
Plagiarism is a common infraction to the UF Honor Code. If you are confused as to what constitutes plagiarism, see https://guides.uflib.ufl.edu/copyright/plagiarism. Plagiarism on any of your assignments **will be reported to the Dean of Students as a UF Student Honor Code violation.** Also, note that **copying solutions for any assignment, regardless of the source (e.g. other students, pirated website solutions), will be treated as plagiarism.** If you have any questions or concerns, please consult with the instructor in this class. Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.

Evaluation of Grades:
- 56% Four in-class exams (14% each)
- 30% Individual homework assignments
- 14% In-class team quizzes

To maximize your partial credit in grading:
1. Write legibly and do not crowd your work.
2. Construct a clear diagram, if appropriate.
3. Write the equations you are using in symbols before substituting in numbers.
4. Label all numerical quantities/values with units.
5. Box your final answer.

Grading Policy:

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Final cumulative numerical grades will be rounded to the nearest tenth of a point. Curving of assignments is exceptionally rare and typically only due to the entire class missing a question. No extra assignments for additional credit are given in this course. **There is no curving of final grades.**

Note: A grade of "C" is the qualifying grade for critical tracking courses (BME 3060 is one of these). Thus, BME majors who earn a "C minus" or lower must retake this course.

Note: In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). A grade of "C minus" is equivalent to a GPA of 1.67. For more information on grades and grading policies, please visit: https://catalog.ufl.edu/ugrad/current/advising/info/academic-progress.aspx

Grade challenges:
We do our best to grade evenly and fairly, but mistakes in grading can happen. Requests to modify points on assignments, quiz, or exams must be submitted in writing to the STS or Dr. Phelps within 1 week from when the graded assignment was made available. The request should identify the question and provide clear justification/reasoning for the requested change. The instructor will then review the request and modify the grade, as necessary. For grade challenge requests, the instructor reserves the right regrade the *entire* assignment, not just the points in question. The instructor also reserves the right to turn down unreasonable or frivolous grade challenge requests.

Students Requiring Accommodations:
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs as early as possible in the semester.

Course Evaluation:
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Commitment to a Safe and Inclusive Learning Environment:
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Inclusion Statement:
It is my intention that students from all backgrounds and perspectives will be well served by this course and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

Lived Name / Pronoun Statement:
I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Online Course Recording
Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat transcript will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://care.dso.ufl.edu.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.