Welcome to BioE 1210/1211: BioThermodynamics. BioThermodynamics uses an interactive framework in the joint exploration (instructor and student) of thermodynamics as it applies on the cellular level. At this most fundamental level, thermodynamics studies the flow of energy, interconversion of energy, maintenance of cellular function and information, and the processes necessary to sustain life itself. Upon completing the course, the student should be able to describe how the three laws of thermodynamics and entropy impact biological systems, and be able to apply fundamental thermodynamics principles to set up and solve problems in physiological systems.

The Honors Section (BioE 1211) also includes a weekly seminar use to review, discuss, and critically evaluate original research articles pertinent to BioThermodynamics.

Course Objectives: Upon completing the course, the student should be able to describe how the three laws of thermodynamics and entropy impact biological systems, and be able to apply fundamental thermodynamics principles to set up and solve problems in physiological systems.

Topics Covered:
- Units / Significant Figures
- Conservation of Mass / Mass Balances
- First Law of Thermodynamics (conservation of energy)
- Second Law of Thermodynamics (entropy)
- Thermodynamic Relations
- Applications to physiologic systems

CourseWeb:
CourseWeb (courseweb.pitt.edu/webapps/login/) is used extensively to disseminate materials for the course, post presentations made in class, post homework solutions, and maintain an up-to-date record of student performance. CourseWeb may also be used for submission of homeworks and/or the project.

In-class activities:
The course is intended to be interactive. Challenges involving applications of thermodynamics based upon current reading are presented in class. Following discussion of applicable background material and thermodynamics principles and fundamentals, students are provided an opportunity to begin developing the necessary approach to solve the challenge in class. Students are expected to complete any unfinished activities before the start of the next class.

Homework:
In-class activities and discussion are the basis of homework assignments. Homework assignments will be collected at the start of class when due. Students are free to discuss the homework assignment with whomever they choose in as much detail as they choose. However, the final product that is submitted is expected to be the student’s own work - not a copy of someone else’s homework. Some homeworks will be group homework, in which case only one submission from the group is required.
Late homework submissions will not be accepted. Individual homework problems will be evaluated to reflect the following knowledge demonstration:

- 0 - Not submitted or insufficient indication of requisite understanding.
- 1 - Sufficient indication of understanding that a correct result is probable with more effort.
- 2 - Correct or sufficiently correct result.

Homework constitutes 20% of the overall grade.

**Design Project:**
Students are expected to participate in and complete a group design project that reflects mastery of the course material in a specified application. Students will be assigned to a design group based upon class demographics (typically 4 per group). The nominal timeline for the project is:
- First week of February: Project description & actual timelines posted in CourseWeb.
- First week of March: Physical model description due.
- Last week of March: Analytical model description due.
- Second week April: Final project report due.

The project will constitute 15% of the overall grade (10% physical model, 10% analytical model, 50% final project report, 30% team contribution).

**Quizzes:**
Reading assignments are made weekly. Short quizzes (normally second class of the week) will be used to assess individual understanding of principles and concepts in assigned readings. Quizzes will constitute 10% of the overall grade.

**Exams:**
Three in-class written exams on approximate dates:
- Exam 1 – First week of February – 15% of overall grade
- Exam 2 – Third week of March – 20% of overall grade
- Exam 3 – Third week of April – 20% of overall grade

**Instructor:**
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746 Benedum  
Telephone: 412.624.9819  
E-mail: patzer@pitt.edu  
Office Hours: will be posted in CourseWeb

**Teaching Assistants:**
TBN  
TBN

**Text:**

**Software:**
We will be using MATLAB in this course. MATLAB is available in the Bioengineering computer labs and in the CIS computer lab in the Benedum basement.
### Grading policy:

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<thead>
<tr>
<th>Category</th>
<th>Weight, %</th>
<th>Weighted Average, %</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Homework</td>
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<td>97-100</td>
<td>A+</td>
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<tr>
<td>Project</td>
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<td>93-96</td>
<td>A</td>
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<td>Quizzes</td>
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<td>90-92</td>
<td>A-</td>
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NOTE: BioE 1211 students will have a 10% component for participation in the seminar that will be prorated with respect to the above weighting.

### Course Policies (Academic Integrity)

Students in this course will be expected to comply with the [University of Pittsburgh's Policy on Academic Integrity](https://www.pitt.edu/~policies/). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an examination, including dictionaries and programmable calculators.

### Course Policies (Disabilities)

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both Dr Patzer and [Disability Resources and Services (DRS)](tel:412.648.7890) as early as possible in the semester. DRS will verify your disability and determine reasonable accommodations for this course.

### Counseling:

The University Counseling Center's staff is dedicated to assisting students in their pursuit of personal and academic growth, to helping students gain a better understanding and appreciation of themselves, and to supporting students as they make important decisions about their lives. If you are in need of counseling services, please contact the [University Counseling Center](tel:412.648.7930) at 334 William Pitt Union, 412.648.7930.