**Course Title, Prefix, and Number**

**Introduction to Biophysics for Mechanical Engineers**  
EML 4930/6934  
Sections XXXX

**Class Periods:**  
MWF, 3rd Period, 9:35am

**Location:**  
Virtual

**Academic Term:**  
Fall 2020

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**Instructor:**  
Thomas E. Angelini  
t.e.angelini@ufl.edu  
352-392-6438  
Office Hours:  
TBA (495 Wertheim).

**Teaching Assistants:**  
• NA

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**Course Description**  
In this course we will cover the molecular components of cells, statistical mechanics and thermodynamics in biological contexts, and mechanical properties of biomolecules. (3 credit hours)

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**Course Pre-Requisites / Co-Requisites**  
None

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**Course Objectives**  
Upon completion of this course, students will demonstrate:

1. understanding of the classes and functions of biological molecules;  
2. the ability to use advanced mathematics to describe and investigate the statistical mechanics and thermodynamics of biological materials and systems;  
3. an understanding of how entropic driving forces generate macromolecular elasticity; and  
4. familiarity with classical models of transport, biological statistical mechanics, and experimental approaches.

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**Materials and Supply Fees**  
NA

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**Professional Component (ABET):**  
4A. EML 4930/6934 supports the following program outcomes as listed in the Mission Statement of the Department of Mechanical and Aerospace Engineering:

- (M1) apply knowledge of chemistry and calculus based physics with depth in at least one of them;  
- (M2) apply knowledge of advanced mathematics through multivariate calculus and differential equations;  
- (M3) be familiar with statistics and linear algebra; and  

4B. Mathematical sciences (33%), physical sciences (34%), engineering sciences (33%).

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**Relation to Program Outcomes (ABET):**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Coverage</th>
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<tbody>
<tr>
<td>a. Apply knowledge of mathematics, science, and engineering</td>
<td>High</td>
</tr>
<tr>
<td>b. Design and conduct experiments, as well as analyze and interpret data</td>
<td>Low</td>
</tr>
<tr>
<td>c. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
<td>Low</td>
</tr>
<tr>
<td>d. Function on multidisciplinary teams</td>
<td>Low</td>
</tr>
<tr>
<td>e. Identify, formulate, and solve engineering problems</td>
<td>High</td>
</tr>
<tr>
<td>f. Understand professional and ethical responsibilities</td>
<td>Low</td>
</tr>
<tr>
<td>g. Communicate effectively</td>
<td>Medium</td>
</tr>
<tr>
<td>h. Understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
<td>High</td>
</tr>
<tr>
<td>i. Recognize the need for and be able to engage in lifelong learning</td>
<td>Medium</td>
</tr>
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</table>
j. Understand contemporary issues
k. Use the techniques, skills, and modern engineering tools necessary for engineering practice

Coverage is given as high, medium, or low. An empty box indicates that this outcome is not part of the course.

**Required Textbooks and Software**
Biological Physics: Energy, Information, Life (Student Edition), Philip Nelson

**Recommended Materials**

**Course Schedule**
See accompanying document

**Attendance Policy, Class Expectations, and Make-Up Policy**

**Class policies**
- Cheating or any other dishonesty will result in failure and prosecution according to university policies. ASME has a website dedicated to engineering ethics, [http://www.asme.org/ethics/](http://www.asme.org/ethics/).
- Students are responsible for all announcements, assignments, etc. made during lectures, including changes in the scheduling of lecture topics and exams. Please make appropriate arrangements with a classmate if you need to miss a class.
- **Attendance is required.**
- The course grade is based partially on class participation, making attendance necessary for graded evaluation.
- Students will be required to lead the class in discussions about homework problems. The number of discussions students must lead will be determined based on course enrollment level.
- Students are expected to conduct themselves in the virtual classroom in a manner which does not interfere with the other students’ learning.
- Any changes in the schedule or assignments will be communicated to the class via email using your Gatorlink (@ufl.edu) email address and using the course web site. You are responsible for monitoring this mailbox and the web site regularly for any class notices.

**Exam policies**
- All exams will be “take-home” format. Exams I-III will be sent to students electronically and collected one week later. Students will submit their completed exams in PDF format.
- It is the students’ responsibility to communicate their knowledge on the exams. In order to be able to grade your work, it must be neat, legible, and follow in logical steps with all work shown. Partial credit may be given for work which can be followed and the nature and magnitude of the mistake identified. No credit will be given for incorrect answers with insufficient indication of how they were obtained.

Excused absences must be consistent with university policies in the undergraduate catalog ([https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx](https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx)) and require appropriate documentation.

**Evaluation of Grades**
- Exams I-III, Final 60% (lowest score will be dropped, 3·20% = 60%)
- Homework Discussions 40%

**Grading Policy**

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<th>Percent</th>
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<td>A</td>
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<tr>
<td>90.0 - 93.9</td>
<td>A-</td>
<td>3.67</td>
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<tr>
<td>87 - 89.9</td>
<td>B+</td>
<td>3.33</td>
</tr>
<tr>
<td>83 - 86.9</td>
<td>B</td>
<td>3.00</td>
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</table>
Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

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://www.dso.ufl.edu/scrc/process/student-conduct-honor-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 TAs in this class.

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: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

More information on UF grading policy may be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx
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](http://www.counseling.ufl.edu/cwc), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**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/](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](https://lss.at.ufl.edu/help.shtml).

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

**Library Support**, [http://cms.uflib.ufl.edu/ask](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/](https://teachingcenter.ufl.edu/).

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

**Student Complaints Campus**: [https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)

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<td>9/16/2020</td>
<td>8</td>
<td>Important statistics in biophysics</td>
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<td>9/18/2020</td>
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<td>10/7/2020</td>
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<tr>
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<td>7.1, 7.2</td>
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<td>Osmotic Flow</td>
<td>7.3</td>
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<td>10/30/2020</td>
<td>27</td>
<td>Wet electrostatics</td>
<td>7.4</td>
</tr>
<tr>
<td>11/2/2020</td>
<td>28</td>
<td>The Special Properties of Water</td>
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**Part II: Diffusion, Dissipation, and Drive**

**Part III: Molecules, Machines, Mechanisms**
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