# Molecular Biomedical Engineering

BME 4311 Section 2429
***Class Periods:*** M, W, F Period 5 (11:45 AM – 12:35 PM)
***Location:*** LIT 0121
***Academic Term:*** Fall 2025

***Instructor:***
Dr. Markia T. Bowe (she/her)
mbowe@bme.ufl.edu
352-294-5020
Office Hours: Thursdays 11am-12pm, BMS J299

***Supervised Teaching Student:***
Please contact through the Canvas website

- Chen Lu, clu1@ufl.edu, STS Office Hours: see Canvas calendar for scheduled times

***Course Description***
This course focuses on fundamental biological principles at the cellular and molecular level, and how they relate to engineering applications. We Introduce the fundamentals of molecular biology for biomedical engineers. It is designed for Juniors (or Seniors) majoring in biomedical engineering to learn the nomenclature and current state of knowledge of the eukaryotic cell, and its related structures. Topics include protein structure and function, enzymes, the structure and nature of DNA and the cellular structure and function of various cellular organelles. Students will learn about energy and the function of mitochondria and chloroplasts, cellular communication, and the function of the extracellular matrix.

***Course Pre-Requisites / Co-Requisites***
Prereq: BSC 2010 Biology 1 and
CHM 3217 Organic/Biochemistry 1 or CHM2210 Organic Chemistry 1
or
PCB 3713C Cellular & Systems Physiology
**each with minimum grades of C.*

***Course Objectives***
Upon completion, a student should be able to:

1. Describe the scope of molecular biomedical engineering across a range of topics covered in class
2. Describe biomolecular principles of protein (primary focus), nucleic acids, lipids with the principles of biochemistry
3. Understand cellular and molecular interactions associated with physiological processes
4. Describe molecular biomedical engineering principles and approaches in (for example) biotechnology, regenerative medicine, molecular engineering as related to the molecular events described above

***Materials and Supply Fees***
None

***Relation to Program Outcomes (ABET):***
The table below is an example. Please consult with your department's ABET coordinator when filling this out.

| Outcome | Coverage* |
|---|---|
| 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics | |

| | |
|---|---|
| 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 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 | High |

*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***
There are no required textbooks for this course.

***Recommended Materials***

- Title: The Molecules of Life: Physical and Chemical Principles
- Authors: John Kuriyan, Boyana Konforti, and David Wemmer
- Edition: 1st
- ISBN: 978-0815341888

Course notes will be derived primarily from the textbook above; however, some notes will be in addition to the textbook with other content discussed in class. **Class attendance is required**.

***Course Schedule***
See course website for the class schedule. The posted schedule is tentative and subject to change.

***Course Topics (see course schedule for specific class dates, assignments, quizzes, and exams)***
***M1: Molecular BME Background***
***M2: Protein Structure & Function***
***M3: Proteomics & Protein Diseases***
***M4: Nucleic Acids***
***M5: Lipids***
***M6: Thermodynamics of Binding***
***M7: Rates of Reactions***

***Evaluation of Grades***

| Assignment | Total Points | Percentage of Final Grade |
|---|---|---|
| Homework Sets (6) | 60 each | 35% |
| Exams (3) | 100 | 60% |

| | | |
|---|---|---|
| Class Participation | | 5% |
| | | 100% |

***Grading Policy***
The following is given as an example only.

| 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 |

***There is no curving of final grades.***

***Academic Policies & Resources***
Class attendance and participation

- **Attendance is expected, required, and noted by instructors each class.** Students will not be able to attend the lectures via Zoom synchronously.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies in the undergraduate catalog: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Make-Up Assignment Policy:

- No makeup assignments are accepted.
- Missed assignments due to official UF or professional travel (e.g. interview, scientific conference, etc.) must be arranged with the instructor in advance and will be handled on a case-by-case basis.

Communication:

- Dr. Bowe prefers that you use Canvas when sending messages for automatic association with the class.
- If communicating through email, include BME 4311 in the subject line.
- Although we are usually faster, please allow up to 48 hours for a response, longer if at night or on the weekend / holidays / breaks.

***Commitment to a Positive Learning Environment***
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:
• Your academic advisor or Undergraduate Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu