

San José State University
Department of Biomedical Engineering
BME 115, Foundations of Biomedical Engineering, Fall 2022

Course and Contact Information

Instructor(s): Abdumelik Mohammed
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Office Hours: Thursdays 3:00–5:00 pm
Class Days/Time: Tuesdays and Thursdays 1:30pm–2:45pm
Classroom: ENG 341
Prerequisites: Engr 010, Chem 001B, Math 032, Phys 050, Biol 030
Note: A separate syllabus is provided for the lab section BME 115L

Course Description

Introduction to the fundamental principles of biomedical engineering. Core conservation equations are applied to mass, energy, charge, and momentum transfer in biomedical systems. Additional topics provide a breadth of exposure in cell and molecular biology, diagnostics and analytical techniques, statistical analysis of biomedical data, bioinformatics, bioinstrumentation, FDA regulations, and biomedical ethics.

Course Format

The course adopts traditional lectures as a primary teaching method. Materials from the textbook or provided by the instructor will be reinforced with homework assignments. A term paper and presentation will also be completed covering a topic of the student's choosing within the field of Biomedical Engineering.

This course incorporates a required lab component (BME 115L), for which a separate syllabus is provided.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found in the Canvas Learning Management System course website. All communications relevant to the course will be sent out using the Canvas messaging system (Canvas email and announcement board). You are responsible for regularly checking with the messaging system through [Canvas](https://sjsu.instructure.com/) to learn of any updates by logging into <https://sjsu.instructure.com/>.

Email Policy

If you have any questions or concerns about the course format, policies, or material, please post them to the Canvas discussion board. Please send **emails regarding personal issues** (academic integrity issues, personal grades, medical issues, etc.) to the professor and/or TA. To receive the most rapid response to your email message, please start the subject line with the characters "**BME115**". Out of fairness to all students, email communications related to technical questions or course policy will *not* be returned (please post these types of questions to Canvas).

Program Information

BME 115 is the first Biomedical Engineering course in the suggested sequence for the BS major, and required prerequisite for the MS BME degree. The purpose of this course is two-fold: introduce students to the breadth of the field and establish core engineering and problem-solving skills applicable across biomedical engineering disciplines.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

- Identify basic components of biological systems and their function
- Apply engineering approaches and prescribed problem-solving techniques to modeling biological systems
- Apply accounting and conservation equations to mass, energy, and charge
- Perform laboratory experiments and obtain measurements from living systems
- Analyze ethical issues surrounding biomedical engineering practice
- Describe recent advances in biomedical engineering within the context of existing knowledge and technology
- Investigate novel biomedical engineering techniques by doing an in-depth research paper and presentation
- Work in teams to complete specified course assignments; namely laboratory work and term paper/presentations
- Apply quantitative skills learned in class to evaluate advances in biomedical engineering (via term paper/presentation).

Required Texts/Readings

A complete list of course readings is available through the Leganto link on Canvas.

Textbook

- Ann Saterbak, Ka-Yiu San, Larry V McIntire, Bioengineering Fundamentals, Prentice Hall, 2nd Edition, (2018).

Other Readings

- Madihally S.V., Principles of Biomedical Engineering, Artech House; 1st Edition (2010), electronic version (.pdf) available free of charge to SJSU students via the MLK library
- Enderle J.D., Bronzino J.D., Introduction to Biomedical Engineering, 3rd Edition, Elsevier (2011).

Library Liaison

Anamika Megwalu

Phone: (408) 808-2089

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Course Requirements and Assignments

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical

practice. Other course structures will have equivalent workload expectations as described in the syllabus. More details about student workload can be found in [University Syllabus Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) at <http://www.sjsu.edu/senate/docs/S16-9.pdf>.

Attainment of the learning objectives (as listed above) will be assessed via homework, two midterm examinations, the final examination, the term paper and presentation, and the assignments for the lab component (BME 115L).

Homework

Students are expected and encouraged to work together on assignments. However, submitted homework should be individual work. Homework must be turned in via Canvas by **11:59 pm on the designated due date**. **Late assignments** will be assessed **20% off for each late day**, up to a maximum of **5 days**. Homework submitted later than 5 days from due date will be given a score of zero.

Midterm Examinations

There will be two mid-semester examinations. Each examination will cover the entire course material covered until the time of the examination. Examinations may include multiple-choice questions, open-ended questions, and problems. During the exam, students can have only a non-programmable scientific calculator. Internet-connected devices, books and notes are not allowed unless explicitly specified by the instructor. The dates of the midterms are indicated in the Lecture Schedule.

Final Examination

The final examination will be held on the date and time stipulated by SJSU's Final Examination Schedule. The final examination will cover the entire course material covered during the semester. The final examination may include multiple-choice questions, open-ended questions, and problems. During the exam, students can have only a non-programmable scientific calculator. Internet-connected devices, books and notes are not allowed unless specified by the instructor.

Laboratory

Students will work in teams to complete the laboratory activities. After each laboratory, student teams will submit a lab worksheet or report. See BME 115L syllabus for details. Students will keep **individual laboratory notebooks**. Students should write down all preliminary calculations, procedures, notes on results, and errors made during the experiment.

Term Paper and Presentation

All students are required to prepare a term paper on a subject relevant to biomedical engineering, and present it in class during a dedicated session. The requirements for the term paper and the evaluation criteria will be posted on Canvas. **Teams of two** students will collaborate on a subject of their choice. The term paper must include an Author Contribution section indicating the specific contributions of each student. Students with no contribution will receive no credit for the term paper.

The term paper must be prepared in accordance with the Biomedical Engineering Department's Thesis Guidelines (posted on Canvas). One electronic copy of the term paper must be submitted to Canvas in a .pdf format by the assigned deadline.

Students must cite any and every source of data or information used in the term paper. Quoting *verbatim* (i.e. "copy and paste") from papers, textbooks, websites or other is prohibited with the following exception. **Very limited use** of verbatim quotes is acceptable **only if** (1) the quoted text is short, (2) quotation marks are used to delimit the quoted text, and (3) an appropriate reference is provided, with a citation number added immediately after the quoted text. Failure to comply with this requirement may be interpreted as plagiarism, which constitutes a violation of academic integrity. All term paper submissions will be automatically scanned in Turnitin to locate matching or similar text within the paper. The instructor will decide whether there is plagiarism case-by-case, in which case academic and administrative sanctions will be assigned according to the [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) (<http://www.sjsu.edu/senate/docs/S07-2.pdf>).

The paper will be submitted in parts. That means, for instance, the introduction section will be submitted separately at an earlier date (specified in the schedule) than the final version. **Late submissions of the final term paper** are strongly discouraged. Late submission of the term paper will trigger a **20% penalty per late day**. **No** submission will be accepted **later than five days after the deadline**. The same late submission penalty policy applies to the submission of the parts of the papers to be submitted earlier.

NOTE that [University policy F69-24](http://www.sjsu.edu/senate/docs/F69-24.pdf) at <http://www.sjsu.edu/senate/docs/F69-24.pdf> states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

Grading Information

Determination of Grades

Grades will be determined based on all the assignments and examinations, weighted as reported in the table below:

Homework	5%
Midterm 1	15%
Midterm 2	15%
Final Exam	30%
Term Paper	10%
Presentation	10%
Laboratory	15%

Failure to complete examinations as scheduled, without prior approval, will result in a zero. Prior approval will be given only under exceptional circumstances. Please contact the instructor as soon as possible if you have such a situation.

Note that "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See [University Policy F13-1](http://www.sjsu.edu/senate/docs/F13-1.pdf) at <http://www.sjsu.edu/senate/docs/F13-1.pdf> for more details.

Letter Grades

<i>Grade</i>	<i>Percentage</i>
<i>A plus</i>	<i>96 to 100%</i>
<i>A</i>	<i>93 to 95%</i>
<i>A minus</i>	<i>90 to 92%</i>
<i>B plus</i>	<i>86 to 89 %</i>
<i>B</i>	<i>83 to 85%</i>
<i>B minus</i>	<i>80 to 82%</i>
<i>C plus</i>	<i>76 to 79%</i>
<i>C</i>	<i>73 to 75%</i>
<i>C minus</i>	<i>70 to 72%</i>
<i>D plus</i>	<i>66 to 69%</i>
<i>D</i>	<i>63 to 65%</i>
<i>D minus</i>	<i>60 to 62%</i>

Classroom Protocol

Attendance and Arrival Times

Students are expected to be set up for lectures by the time the class begins. Attendance in class is not mandatory and shall not be used per se as a criterion for grading. However, class attendance and participation are highly recommended.

Behavior

Students should remain respectful of each other at all times. Students will respect a diversity of opinions, ethnicities, cultures, and religious backgrounds. Interruptive or disruptive attitudes are discouraged. While in the classroom, the use of electronic devices (laptops, tablets, smartphones) MUST be limited to activities closely related to the learning objectives. While in the classroom, electronic devices should not be used for personal communication, including messaging and use of social media. All cell phones must be silenced prior to entering the classroom.

Safety

Students should familiarize themselves with all emergency exits and evacuation plans. In particular, if the class meeting ends in the evening, students should be aware of their surroundings when exiting the building, and are encouraged to carry a cell phone for emergency communications.

University Policies

Per [University Policy S16-9](#), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on [Syllabus Information](#).

[web page](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

Academic Integrity

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy F15-7](#) requires you to be honest in all your academic coursework. Any incident of academic dishonesty during an exam will result in an F in the course and the incident will be reported to the Office of Academic Affairs for additional review and possible sanctioning. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. Visit the [Student Conduct and Ethical Development](#) website for more information.

BME 115, Foundations of Biomedical Engineering, Fall 2022, Course Schedule

Tentative Course Schedule (subject to change with fair notice)

Week	Date	Topics	Term paper deadlines
1	08/23	Introduction - General information - Syllabus	
	08/25	Engineering calculations	
2	08/30	Conservation principles, Accounting equations	
	09/01	Conservation of mass	
3	09/06	Open non-reacting steady-state systems	
	09/08	More problems on non-reacting steady-state systems	
4	09/13	Systems with chemical reactions	
	09/15	<i>Guest lecture: Exploring the scientific literature</i> <i>Anamika Megwalu</i>	
5	09/20	Dynamic systems	
	09/22	Multi-component systems – Closed problems	
6	09/27	Midterm 1 review	
	09/29	Midterm 1 exam (ENG 341)	
7	10/04	Conservation of energy, basic concepts	
	10/06	Midterm 1 solution	
8	10/11	Heat transfer	Introduction
	10/13	Energy transfer, work	
9	10/18	Enthalpy	Literature review, bibliography
	10/20	Latent heat	
10	10/25	Conservation of energy: dynamic systems	Method, discussion
	10/27	DNA replication and PCR	
11	11/01	Midterm 2 review	
	11/03	Midterm 2 exam (ENG 341)	
12	11/08	Conservation principles. Midterm #2 discussion	Conclusion, future perspectives
	11/10	Bioinstrumentation: Conservation principles	Final draft

Week	Date	Topics	Term paper deadlines
13	11/15	Bioinstrumentation: Electric circuits	
	11/17	Biomedical optics: Introduction	Peer review
14	11/22	Biomedical optics: Light-tissue interactions	
	11/24	No class: Thanksgiving Day	
15	11/29	Term Paper presentations	Final submission
	12/01	Term Paper presentations	
16	12/06	Final exam review	
17	12/14	Final exam 12:15pm-2:30pm (ENG 341)	