BIOM 1720: Introduction to Biomedical Engineering Tools

Stephen Strain
Hello! I am Dr. Strain. Welcome to BIOM 1720. We will meet in EA 102D. Please feel free to email me at sfstrain@memphis.edu with any questions, concerns, etc. that you might have.

I look forward to hearing from you!

For class business, use University email only—I cannot record verbal discussions after class, so if, for instance, you have an issue with attendance or assignment due dates, send an email. **Do not send messages through other students; instead, communicate directly with me by email.** My address is sfstrain@memphis.edu. Please include “BIOM 1720” in the subject line when you write.

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**Instructor**

Dr. Stephen Strain  
[sfstrain@memphis.edu](mailto:sfstrain@memphis.edu)

Office: ET308  
Virtual Office: [https://memphis.zoom.us/j/3271381594?pwd=VW9FYThrS293d0FwUYZ2TVFyeVJLdz09](https://memphis.zoom.us/j/3271381594?pwd=VW9FYThrS293d0FwUYZ2TVFyeVJLdz09)

Office hours: Monday and Wednesday 10-11 AM, or email for appointment

**Teaching Assistant:** Jada Sandridge ([jksndrdg@memphis.edu](mailto:jksndrdg@memphis.edu))

**Course Description:** Use of computer tools for data analysis, presentation, documentation; introduction to programming; individual and group design projects. **COREQUISITE:** ENGR 1010.

This course is required for the Biomedical Engineering Degree Program.

**Required Materials:**

- Internet Access
- Desktop Computer, Laptop, or Tablet
- Canvas ([memphis.instructure.com](https://memphis.instructure.com))

University resources to support online learning: [https://www.memphis.edu/uofmglobal/students/online-intro.php](https://www.memphis.edu/uofmglobal/students/online-intro.php)

**Interactive Textbook (required):** *Programming in MATLAB, zyBooks.com*

1. Click any zyBooks assignment link in your learning management system  
   (DO NOT go to the zyBooks website and create a new account)
2. Subscribe

A personal computer is required. A laptop with MS Windows 10 or higher is highly recommended; see Herff College requirements at [https://www.memphis.edu/herff/departments/computer-requirements.php](https://www.memphis.edu/herff/departments/computer-requirements.php)

**Required software:** MATLAB, Microsoft Word, and Microsoft Excel.

**Recommended:** A free account at [https://chat.openai.com](https://chat.openai.com). Generative AI will be used extensively in this course. Please contact the instructor with any questions or concerns. See **Course Policy on Ethical Use of Generative AI** below.

*A free MATLAB download is available for UM students through the university’s site license at [https://www.mathworks.com/academia/tah-portal/university-of-memphis-40714972.html](https://www.mathworks.com/academia/tah-portal/university-of-memphis-40714972.html)
BIOM 1720 Introduction to Biomedical Engineering Tools
Spring 2024
Tuesday-Thursday 1:00-2:25P
EA 102D

MS Word & Excel is available for UM students through the university’s technology access program at
https://www.memphis.edu/umtech/solutions/software/software.php

Course Learning Outcomes
- Use algorithms and logic to design computer programs in a high-level programming language (MATLAB)
  - Make use of arrays/matrices
  - Develop custom functions
  - Implement graphing in two dimensions
- Become familiar with various areas of biomedical engineering including biomechanics, biomaterials, and bioelectricity
  - Make physiologic and material measurements
  - Use physiologic models
  - Gain understanding of integration of mathematics and physical sciences in engineering
- Become skilled at technical documentation and report writing

Course Topics
- MATLAB programs and built-in functions
- MATLAB input/output and plotting
- MATLAB logical functions and control structures
- Tensile testing of biomaterials
- Technical writing
- Data analysis and graphical presentation
- Team project incorporating MATLAB
- NEW: AI Literacy (see Course Policy on Ethical Use of Generative AI below)

Grading

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<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
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<tbody>
<tr>
<td>5%</td>
<td>Attendance (pass/fail)</td>
</tr>
<tr>
<td>15%</td>
<td>Homework</td>
</tr>
<tr>
<td>20%</td>
<td>Individual Technical Reports</td>
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<tr>
<td>15%</td>
<td>Team Project</td>
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<td>15%</td>
<td>Exam 1</td>
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<td>15%</td>
<td>Exam 2</td>
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<td>Final Exam</td>
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Letter grades will be determined as below, with plus/minus modifiers for A, B, or C grades and plus modifier for D grade. Modifiers (eg A+ or C-) are applied if numerical grade is above X7.5% or below X2.5%. I reserve the right to round up or down or otherwise adjust the final grade based on other factors such as attendance, effort, and engagement inside and out of class.

A: (90-100); B (80-89); C (70-79); D (60-69); F (<59)

Note: The grading scheme may be revised as required during the term.

Attendance (5%)
In order to be successful in this class, attendance is MANDATORY. You are allowed at most three unexcused absences.

If you have a health condition that prevents you from regular class attendance, you MUST register with Disability Resource Services (see Student Accommodations below) and contact me to discuss an alternative plan ASAP.

- Attendance at all class meetings is required.
- You are allowed three unexcused absences.
- **A fourth unexcused absence will result in an “F” for the course.**
• Absences will be excused at my discretion, for instance, for circumstances such as illness, personal/family emergency, academic/professional commitments, etc. must be documented via an email to Dr. Strain. Student athletes may provide scheduled absences for athletic events per usual methods. Email me at sfstrain@memphis.edu if you wish an absence to be considered for excusal.

Homework (15%)
Homework consists of required assignments and must be submitted as directed on Canvas (memphis.instructure.com). Homework assignments will not be accepted via email. Homework assignments are graded and must be turned in by the specified deadline. Approximately three (3) homework grades will be dropped, allowing for such circumstances as time management issues or inadequate preparation. Late assignments may be accepted for other special circumstances at the discretion of the instructor.

Technical Reports (20%)
Individual technical reports are required. These reports will be based on laboratory activities completed during class. Instruction on technical writing and report rubrics will be provided. Drafts will be turned in first, and feedback will be provided. This will resemble the peer review process. Then revisions must be made and a revised, final report turned in.

• Failure to revise the final report according to the draft feedback will result in a penalty of at least a letter grade on the final report.
• Failure to turn in the final report will result in an “F” for the course.

Team Project (15%)
A team project is required. Detailed instructions, deliverables, and grading scheme will be provided. Teammates will be assigned by the instructor.

Exams (45%)
Three (3) exams will be given; two during the semester and a final exam. The final exam is not comprehensive; however, MATLAB topics build upon previous topics and the final exam will include topics from previous exams. Exam dates will be posted to Canvas.

Honors Section
If you are enrolled in BIOM 1720-350, you are in the Honors section. If you are enrolled in BIOM 1720-001, you are enrolled in the regular (non-Honors) section. Honors students must complete the course requirements listed above as well as an additional activity that will be assigned towards the end of the term. The assignment will be graded on a pass-fail basis. If the honors assignment is not completed or if it receives a failing grade, the maximum final grade in the course will be B-.

Policies
1. Attendance is REQUIRED. See above for attendance policy.
2. You are responsible for all material, whether covered in class or as part of an assignment. If you miss a class, you are responsible for obtaining any material covered in class.
3. You are expected to come to class prepared and to participate actively in class. This participation may include, but not be limited to, explanation or demonstration of concepts, in–class problem solution, or discussion of assignments. Volunteers for participation may be solicited, or you may be called upon.
4. I will often use Zoom to record a class lecture, but this is NOT for remote attendance. Unless university policy changes, you must attend class face to face. For questions, contact me at sfstrain@memphis.edu.
5. There will be regular assignments, and many of them will be graded. You are expected to complete and understand all assignments, whether they are graded or not.
6. Except when teamwork is specifically required, any work submitted for a grade must be your own original work. Working together on assignments is certainly acceptable and encouraged, but each person must work through the problem individually. Do not simply copy someone else’s solution. Do not electronically share your assignment files with classmates.
7. Assignments must be turned in by the due date in Canvas. All assignments must be submitted via Canvas unless otherwise stated—I cannot accept assignments by email. You may contact me at sfstrain@memphis.edu regarding late assignments, but an extension will be granted only at my discretion and is NOT guaranteed.

8. No make-up exams will be given. If your absence from an exam is officially excused (documentation required), an alternate exam grade (e.g., final exam grade) will be substituted for the missing exam. A grade of zero will be assigned for a missed exam in all other cases.

9. Academic dishonesty and disruptive behavior of any form will not be tolerated. See the Code of Student Rights and Responsibilities at www.memphis.edu/studentconduct. See the section on Academic Integrity below.

10. You are responsible for determining the availability of the computing resources used in this class and for scheduling your work accordingly.

11. You must fully comply with all university guidelines and applicable laws regarding the use of computing facilities and software that may be provided for this course.

12. You should bring your own laptop to class. The computer and wireless usage policy is as follows: (a) Checking email and social websites, surfing, gaming, or other activities not directly related to the assigned task is not appropriate. (b) Cell phone usage, including text messaging, is not appropriate at any time during class unless instructed to do so.

13. Please treat the classroom environment as you would for any professional situation: Be on time, be prepared, be respectful, do not disrupt or distract others.

14. These policies may be revised or augmented as required during the term.

**Academic Integrity**
The University of Memphis expects all students to behave honestly. The Code of Student Rights & Responsibilities explains what constitutes a violation of our Academic Integrity policy. Please see the website for more information: https://www.memphis.edu/osa/. Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students who violate the academic misconduct policy, either directly or indirectly, through participation or assistance, are immediately responsible to the instructor of the class in addition to other possible disciplinary sanctions which may be imposed through the regular institutional disciplinary procedures.

**Student Health**
Students who are experiencing symptoms such as sneezing, coughing or a higher than normal temperature should inform me by email so they can be excused from class and should stay home. Students should contact their health care provider or the Student Health Center at https://www.memphis.edu/health.

**Student Accommodations**
Students with accessibility issues or learning accommodation issues due to a disability should contact Disability Resources for Students (DRS) to submit an official request for course accommodations. Contact DRS at 901.678.2880 or at drs@memphis.edu. (https://www.memphis.edu/drs/index.php)

**Student Resources**
Students who need additional resources can contact the Dean of Students Office at https://www.memphis.edu/deanofstudents/crisis/index.php.

Note: Policies may be revised during the term at the instructor's discretion.
Course Policy on Ethical Use of Generative AI

NOTE: This policy is ONLY applicable in this class (BIOM 1720, Spring 2024, Dr. Strain).

Generative AI (GAI), such as ChatGPT, Google Bard, and many others, is beginning to transform various aspects of society, including academic and technical fields. We will integrate AI literacy into this course’s curriculum, focusing on its application in biomedical engineering, particularly in MATLAB programming and technical writing.

Scope of Use

Inappropriate and/or unethical use of GAI can negatively impact your education and professional development. Therefore, the following guidelines apply:

1. **No Academic Dishonesty**: Do not use GAI to generate answers for graded assignments or tests. Violations will be referred to the University’s Office of Student Accountability.

2. **Permissible Use**: You may use GAI to
   a. understand concepts or questions related to lectures or assignments;
   b. generate ideas for code, reports, or team project topics;
   c. get suggestions for code improvement, reports, or presentations; or
   d. assist in debugging code.

Additional Guidelines

1. **Cite AI Use**: Treat AI like any other source. If AI helps draft or edit a MATLAB script or report, cite it appropriately.

2. **Document Interaction**: When using GPT-4 or similar tools, provide a transcript of your interaction in MATLAB comments (for code) or in an appendix (for reports).

3. **Bibliography Summary**: Include a summary in your bibliography or works cited page detailing how you used the AI.

4. **In-text Citation for AI**: For each paragraph aided by AI, include an in-text citation.

5. **Original Thought Requirement**: The majority of the insights and arguments in your work should be your own. Using AI for phrasing or structure is acceptable, but the core ideas must be original.

6. **Be Responsible**: Use AI responsibly to enhance your work, not to bypass critical thinking and creativity. Consult the instructor or TA if in doubt.

Additional Points to Consider

1. **Ethical AI Usage**: When using AI for topics related to healthcare and biomedical engineering, ensure the data and methods you employ adhere to privacy laws and ethical considerations.

2. **Data Integrity**: When using AI for data generation or simulation, clearly state the limitations and potential biases of the model in your report.

3. **Transparency in Team Projects**: In the case of team projects, disclose the extent of AI use to your team members.

4. **Quality Control**: Ensure that information generated by AI is factually accurate and scientifically valid. Verify generated content with peer-reviewed sources.

5. **Consultation and Approval**: For substantial use of AI in a project or paper, obtain approval from the instructor to ensure it aligns with course objectives and ethics.

6. **Regular Updates**: This policy may be subject to changes or updates as we uncover more about the capabilities and limitations of AI technology.

NOTE: In case of new developments in AI ethics or technology during the semester, the instructor reserves the right to amend this policy to protect academic integrity and ethical standards.

By adhering to this policy, you commit to responsible and ethical use of generative AI in this course.