Introduction – Biomedical engineering (BME) is the application of engineering principles to medicine, health care and biological problems. The purpose of the two Fundamentals courses is to teach you some basic engineering skills that are important in the BME field and to offer an introductory view to the profession of biomedical engineering. The field of BME is very interdisciplinary and includes concepts from such diverse areas as mechanical engineering, electrical engineering, materials science, computers, physics, chemistry, anatomy and physiology, cell biology and genetics.

Bioen 2100 is the second of the two Fundamentals classes. This semester we will cover applications of concepts from physics (mechanical and electrical) to biomedical engineering, particularly as related to the human cardiovascular system. We also introduce both concepts and practice of computer and electrical modeling of the cardiovascular system. (The first Fundamentals course, Bioen 1020, covers the biochemical, materials, sensors and cellular aspects of the BME field, among other topics.)

Course Materials:
1. Course Textbook (Parts I and II. 15 Chapters plus Major Project) – included in this handbook as part of course fees. It is also available online through the Marriott Library under the title: *Introduction to Biomedical Engineering, Christensen*.


3. USB Flash Drive for storing your MATLAB programs (recommended) – your choice, capacity not important.

4. Electronic Components for Major Project – included as part of course fees.

5. Major Project Notebook – wirebound notebook, included as part of course fees.

6. Notebook/Computer program for notes and homework, different from Major Project Notebook (your choice).

Course Schedule – The course schedule together with associated notes and other materials are available on the Canvas system.

Major Project – A basic educational principle is that you only learn what you practice. (Lectures give directions, motivation and examples, but to really learn a skill you must do it yourself.) In this class, practice is by the Major Project, by homework assignments, and by the Exercises in class. The Major Project involves both computer modeling and electronic circuits. It will take all semester to complete, but it encompasses much of the material from this class. The project goal is to model the human cardiovascular system, as described at the end of this handbook.

Reading Quizzes – In lectures we will mostly highlight important concepts, give examples, answer questions, and solve sample Exercises. We will assume that each student is familiar with the assigned material from the textbook before the lecture. Therefore, it is important for you to read the topics to be covered before coming to lectures. To guide this process, there will be weekly quizzes (usually at the beginning of class on Mondays) covering the week's material. These will be closed-book. Note: Four of the quizzes will be expanded to also contain questions related to that week's Major Project checkoff. There will be no make-up quizzes.

Homework – There will be homework assignments almost every week that you must complete and hand in. Since we provide the answers for almost all the questions, you should work until you get the answer. Your grade will be based on whether you have completed all the necessary steps (full credit) or if the work is incomplete or absent (partial or no credit). We will only accept homework on time and will not grade late homework.
Exams – There will be two one-hour, in-class, closed-book mid term exams covering topics from the homework, lectures and Major Project. There will also be a comprehensive closed book final exam during the regular final exam period. No make-up exams will be given.

Grading – Grade percentages will be assigned as follows:

- Reading Quizzes, Closed-book: 15%
- Homework (total normalized): 15%
- Mid term exams (each worth 12%): 24%
- Final Exam: 21%
- Major Project: 15%
- Lab Grade: 10%
- Total: 100%

Grading Scale:

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<th>% Score</th>
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<tr>
<td>≥ 95.0</td>
<td>A</td>
<td>≥ 90.0</td>
<td>A-</td>
<td>≥ 75.0</td>
<td>B-</td>
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<tr>
<td>≥ 85.0</td>
<td>B+</td>
<td>≥ 80.0</td>
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<td>≥ 65.0</td>
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<td>≥ 70.0</td>
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<td>≥ 55.0</td>
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Final grades are calculated from recorded scores and posted on the class Canvas web site.

Collaboration, Individual Work, and Exam Cheating – You are encouraged to consult and seek collaboration with others, including the instructor and teaching assistants, to seek help in understanding and solving the homework and Major Project. You should ask questions and help each other figure out the path to the solutions. This is how we learn. However, you must each compose and submit your own homework or Major Project answers; you must do your own work. You must keep your own Major Project notebook and records, and you will report for check off and to answer questions about the Major Project individually.

Of course, quizzes and exams are completely individual, and during these exams you must not give or get help from any other person. Any violations of this rule will be dealt with by strict College disciplinary policy.

Lab/Consultation Hours – There are (at least) five three-hour lab periods scheduled each week in MEB 2560 (see attached schedule). During your scheduled lab time, a teaching assistant will be available to provide help on the Major Project and homework and to answer any of your questions. You may even get help on homework or the Major Project during a lab period that is not your assigned lab (note: this does not apply during the four Major Project checkoff weeks). The lab will only be open during the times listed. In addition, the course instructor has Office Hours in MEB 2560 during the Friday afternoon labs. The instructor is also available by email and in person by appointment (macleod@sci.utah.edu)

Note: This syllabus has been created as a guide to the class and is as accurate as possible. However, all information is subject to change as class needs change. Any changes will be discussed in advance during class sessions.