**BME 5410:  FALL 2023   Biomedical Physiology and Engineering I**

Instructors: Dr. Michael Brown, Dr. Sharan Ramaswamy, Dr. Oleksii Shandra

**Course Objective**

This is an introductory course for new BME graduate students.  It emphasizes physiology and associated engineering concepts frequently encountered in the Biomedical Engineering field.  It starts by introducing biological processes and interactions at the molecular, cellular and organ levels to help students understand how an organism works.  Subsequently, key physical concepts and engineering analyses of selected physiological functions under normal and diseased states will be introduced.  The focus of this course will be (1) molecular/cellular physiology and engineering and (2) cardiovascular physiology and engineering.  This course should prepare BME graduate students for advanced courses in life science and biomedical engineering areas.

**Learning Outcomes**

(1) Obtain fundamental knowledge about common biological processes and interactions of biological systems at the molecular and the cellular levels.

(2)  Obtain fundamental knowledge about engineering principles associated with those common biological processes and interactions of biological systems at the molecular and the cellular levels.

(3) Obtain fundamental knowledge about biological processes and interactions of the cardiovascular system.

(4)  Obtain fundamental knowledge about engineering principles associated with biological processes and interactions of the cardiovascular system.

**Prerequisites**

NA

**Grading**

33.3%  Exam and Paper- Dr. Brown

33.3%  Mini-Project and Exam Dr. Ramaswamy

33.3%  Dr. Shandra

**Major Topics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Schedule** | | |  | |  | |
| Class # | **Date** | **Major Topics** | | **Instructor** | |  |
| 1 | 22-Aug | **Cellular and molecular physiology** | | Brown | |  |
| 2 | 24-Aug | Basic Biochemistry  Basic cell processes- homeostasis, | | Brown | |  |
| 3 | 29-Aug | Compartmentation, cells and tissues, | | Brown | |  |
| 4 | 31-Aug | Energy, cellular metabolism, membrane dynamics and communication | | Brown | |  |
| 5 | 05-Sept | Brown | |  |
| 6 | 07-Sep | |  | | --- | | **Cardiovascular physiology** | | Cardiac Anatomy, physiology and function. | |  | | Cardiac Conduction and EKG. | | Pathophysiology of Cardiac Diseases. | | Blood Pressure Regulation. | | Cardiac Devices and their applications in Medicine. | | | Brown | |  |
| 7 | 12-Sep |  | |  | |  |
| 8 | 14-Sep |  | | Brown | |  |
| 9 | 19-Sep |  | | Brown | |  |
| 10 | 21-Sep | Exam- Dr. Brown | | Brown | |  |
| 11 | 26-Sept | **Cardiovascular engineering- Dr. Ramaswamy** | | Ramaswamy | |  |
| 12 | 28-Sept |  | | Ramaswamy | |  |
| 13 | 03-Oct |  | | Ramaswamy | |  |
| 14 | 05-Oct |  | | Ramaswamy | |  |
| 15 | 10-Oct |  | | Ramaswamy | |  |
| 16 | 12-Oct |  | | Ramaswamy | |  |
| 17 | 17-Oct | Ramaswamy | |  |
| 18 | 19-Oct |  | | Ramaswamy | |  |
| 19 | 24-Oct |  | | Ramaswamy | |  |
| 20 | 26-Oct |  | | Ramaswamy | |  |
| 21 | 31-Oct | **Cardiovascular engineering- Dr. Shandra** | | Shandra | |  |
| 22 | 02-Nov |  | | Shandra | |  |
| 23 | 07-Nov | Shandra | |  |
| 24 | 09-Nov |  | | Shandra | |  |
| 25 | 14-Nov |  | | Shandra | |  |
| 26 | 16-Nov |  | | Shandra | |  |
| 27 | 21-Nov | Shandra | |  |
| 28 | 28-Nov |  | | Shandra | |  |
| 29 | 30-Nov |  | | Shandra | |  |
|  |  |  |  |  |  |  |

**Text Books**

**Human Physiology: An Integrated Approach, Eighth Edition by Dee Silverthorn     ISBN- 13:978-0-321-75007-5**

 **The final grade may be curved according to class performance.**

**The grading scale below can be used as a general guide for how final grades are determined:**

**93-100%      A**

**90-92.99%   A-**

**87-89.99%   B+**

**83-86.99%   B**

**80-82.99%   B-**

**77-79.99%   C+**

**70-76.99%     C**

**60-69.99%   D**

**< 59.99%     F**

**Make up tests or quizzes are given only if the student receives permission from the instructor before the exam has been given or has an excused absence.  Acceptable excuses do not include the student not being prepared for the exam.  If a situation arises where prior notification to the instructor is not possible, the instructor should be contacted as soon as possible after the exam has been given and any extenuating circumstances should be explained.  Documentation of any extenuating circumstances is required.  If the documentation is found to be sufficient (as determined by the instructor) excused students will be allowed to make up the exam (which may be altered from the original exam given) at a time that is mutually agreed upon.  During testing, no one may leave the classroom for any reason other than if you have finished the exam.  All Cell Phones and Electronic Devices need to be turned off before the exam starts.** **The University has an honor code to ensure the academic integrity at FIU. Any student caught cheating on an exam or engaging in unethical behavior will receive a grade of F for the course and the dean will be notified and asked to pursue further action.** **No books, notes, problem sets, cell phones, Blackberries, laptop computers, nor any other materials may be consulted during exams.** **Regular attendance of classes is strongly recommended. I might make some changes in exam dates and material, etc. If you somehow miss a class, it is your responsibility to know about such in-class happenings.  The scheduled dates for lectures, quizzes and tests may vary slightly from what is listed below.  I will update the syllabus as required throughout the semester.  *Please be advised that classes may be audio and visually recorded and/or subject to course capture for future access by students in this course. Your attendance/ participation in this course constitutes consent to such recordings, which will only be used for educational purposes by students in the course and securely stored in University systems. If there is a concern regarding the recording and use of such recording, please contact FERPA@fiu.edu.***

**Expectation of Academic Integrity:  All students are expected to not represent someone else’s work as their own, not to cheat, not to aid another’s cheating, and to conform to all academic integrity norms as described in FIU’s student code of conduct (**[**integrity.fiu.edu (Links to an external site.) (Links to an external site.)Links to an external site.**](https://outlook.office.com/owa/redir.aspx?REF=rHyxtaIR9YgvOZUHFavnQ5_Ji6j-taVCEoTEpnkH-5QLPUOERyrXCAFodHRwOi8vaW50ZWdyaXR5LmZpdS5lZHU.)**). The Department of Biomedical Engineering is committed to ensuring the honesty and academic integrity of our students and students violating this code will be subject to academic misconduct proceedings. Additionally in this course, you may receive a*zero for the assignment, receive a failing grade for the entire course depending on the severity of the offence, or receive a warning and be sent to an academic advisor to document the incident on your academic record.*** Biomedical engineers have a special obligation to act ethically and honesty because of our role in the maintenance and improvement of public health. The BME department expects you to be honest in academic endeavors, not represent someone else’s work as your own, and not cheat or aid another’s cheating, as summarized in FIU’s Student Conduct and Honor Code, section 6. The BME department takes this code seriously, and we will report violations to the university directly, where the Student Conduct Committee will evaluate your case.

*Please be advised that classes may be audio and visually recorded and/or subject to course capture for future access by students in this course. Your attendance/ participation in this course constitutes consent to such recordings, which will only be used for educational purposes by students in the course and securely stored in University systems. If there is a concern regarding the recording and use of such recording, please contact FERPA@fiu.edu.*