Advanced Engineering Physiology of the Human Body
Course Syllabus

Course Number/Section	BMEN 4330-001 (class no. 23267)
Term	Spring 2017
Location/Time	**SOM 2.904– Mo/We 4:00 – 5:15 PM**
	Office Hours (Mo/We 5:30 – 6:30 PM) by appointment

Professor Contact Information
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Course Pre-requisites:
BMEN 3330-001 Engineering Physiology of the Human Body

Course Description:
BMEN 4330 Advanced Engineering Physiology of the Human Body (3 semester credit hours) Advanced extension of BMEN 3330. This course will cover in-depth examples of the human physiology with engineering terms, with specific emphasis on synthetic biology approach to biological networks and systems biology approach to complex diseases, such as cancer and mental disorders. Prerequisite: BMEN 3330. (3-0) Y

Student Learning Objective/Outcomes:

1. Describe modern engineering tools used to monitor physiological system function.
2. Design an engineering system to study biophysical processes.
3. Use software to model a physiological system or process.

Reading:

-*Required Reading:* Current manuscripts from top-tier manuscripts (provided as pdf in Blackboard)

-*Optional Text* - Human Physiology: An Integrated Approach. **Dee Unglaub Silverthorn** Publisher: Benjamin Cummings.

Clicker Use in Class
This class will require the use of a clicker. A clicker is an audience response device that resembles a small calculator. This allows you to provide real-time feedback to your instructor during class. Clickers will be used for In Class PopQuiz examination.

Assignments and Academic Calendar:

Mon	1/9	Introduction to Course/Review
Wed	1/11	1. Markaman et al., Cell 2015 Neocortical Microcircuitry [Intro] (Brain)
Mon	1/16	**MLK Holiday – NO CLASS**
Wed	1/18	Markaman et al., 2015: Neocortical Microcircuitry [Results]
Mon/Wed	1/24 & 1/26	2. Danaher et al., 2016: Metabolomics in High Intensity Exercise (Muscle contraction) **Team 1**
Mon/Wed	1/30 & 2/1	3. Lee et al., 2016: Bending insensitive pressure sensor (skin sensors) **Team 2**
Mon/Wed	2/6 & 2/8	4. Tabebordbar et al., 2016: In Vivo Gene Editing (Muscular Dystrophy) **Team 3**
Mon/Wed	2/13 & 2/15	5. Oh et al., 2016: Skin Microbiome (Immune/skin) **Team 4**
Mon/Wed	2/20 & 2/22	6. Chu et al 2016: CrispGold and B-cell activation (Immune System) **Team 5**
Mon/Wed	2/27 & 3/1	7. Wang et al., 2016: Flow dependent YAP/TAZ (Circulation/Atherosclerosis) **Team 6** ***Midterm Device/Instrumentation Paper Due (March 1st at Beginning of Lecture)***
Mon/Wed	3/6 & 3/8	8. Donati et al. 2016: BMI rehabilitation in paraplegia (Brain Machine Interfacing) **Team 7**
	3/13 & 3/18	**SPRING BREAK**
Mon/Wed	3/20 & 3/22	9. Rajan et al., 2016: Computational Modeling of Neurons (Sensory) **Team 8**
Mon/Wed	3/27 & 3/29	10. Ponnaluri et al. 2016: Modeling of Heart Failure (Heart disease) **Team 9**
Mon/Wed	4/3 & 4/5	11. Pivkin et al 2016: Modeling of RBC (Spleen) **Team 10** ***Organ Physiology Modeling Paper Due (April 5 at Beginning of Lecture)***
Mon/Wed	4/10 & 4/12	12. Bavli et al 2016: Microfluidics (Liver) **Team 11**
Mon/Wed	4/17 & 4/19	13. Kolesky et al., 2016: 3D Tissues (Several Organs) **Team 12**
Monday	4/24	**Best Device/Instrumentation Papers Presentation Day**
Wednesday	4/26	**Best Modeling Projects Presentation Day** **(Last day of class)**

Grading:

1. **Instrumentation Report**
    a. Describe a Recent Advanced Engineering Development, which enabled the fabrication of Novel Instrumentation or medical devices for the study of Human Physiology.
    b. Briefly describe the Engineering principles and methods used model.
    c. Identify limitations and propose alternatives engineering methods to improve upon design.
    d. A 8-page (total) Printed Report will be collected at the beginning of class on the due date.
        - Single-spaced, 11-point Times New Roman Font, with citations in Science or Nature format, with normal 1" margins. Engineering formulas and diagrams must be included.
    e. Grading: 10% Introduction, 10% Justification, 30% Instrumentation description, 25% validation, 15% Limitations and proposed improvements, 5% Ethical considerations and 5% References.
        i. ***If selected*** by Dr. Romero, you will be asked to prepare and present a 10 minute slide show of your model for extra-points over the final grade

2. **Final Project: Modeling of a physiological system (Comsol, Matlab, SolidWorks)**
    a. Using reported scientific literature, describe the modeling of a H. Physiology Event
    b. Describe the formulas, assumptions and validation of the model
    c. Compared to other models and describe advantages and limitations, and propose alternatives engineering methods to improve upon design.
    d. Extra credit will be given for students who use modeling software to demonstrate the proposed design.
    e. A 8-page (total) Including physiological systems/equations and modulation. Printed essays will be collected at the beginning of class on the due date.
        i. Single-spaced, 11-point Times New Roman Font, with citations in Science or Nature format, with normal 1" margins. Include Simulink diagram and figures.
    f. Grading: 10% Introduction, 10% Justification, 30% Model description, 25% validation, 20% Limitations and proposed improvements, 5% References.
        i. ***If selected*** by Dr. Romero, you will be asked to prepare and present a 10 minute slide show of your model for extra-points over the final grade

3. **In-Class Presentation**
    a. Topics can be found on the class schedule
    b. **TEAMS**: 4 members/team will be selected will be assigned a research article: two for Part A and two for Part B of each manuscript.
    c. Presentations will go over the physiological system followed by the research articles and the figures.
        i. **Part A:** Cover of Background, Authors, Institutions, Introduction, Hypothesis
        ii. **Part B:** Explanation of Methods, Figures and Conclusion.
    d. Presentations will be followed by in depth discussion and Q/A. *You are expected to lead the class and answer questions about the topic*.
4. **Pop Quizzes**
    a. Quizzes will be both in class as well on blackboard.
5. **Participation**
    a. Students will be randomly selected in class to present one of the figures of different papers.
    b. Participation in class will be graded.

6. **Grading**

Assignment	Weighted Value
Midterm Paper	20%
Final Modeling Project	20%
In Class Presentation	30%
Pop Quizzes	15%
Participation (in class/online)	15%

Grades	98+	97-94	93-90	89-86	85-83	82-80	79-76	75-73	72-70	69-60	< 60
	A+	A	A-	B+	B	B-	C+	C	C-	D	F

***If you miss a project, a grade of 5 will be given. There is no excuse unless documentation for a University-approved excuse (see Catalog) is received within one week of the deadline date.** Note: UTD policy will not allow distribution of grade over the phone call or email. *There will be no extra credit work to make up the grade and no mercy points will be given.*

Attendance and Drop Policy:

No mandatory attendance. If you are dropped from this class for non-payment of tuition, you may secure an Enrollment Loan through the Bursars Office. You may not continue to attend class until your Enrollment Loan has been applied to outstanding tuition fees.

Academic Dishonesty:

Academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form at The University of Texas at Dallas. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. (Regents Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2. Subdivision 3.22).

Americans With Disabilities Act:

It is the policy and practice of The University of Texas at Dallas to make reasonable accommodations for students with properly documented disabilities. However, written notification from the Office of Student Access Ability (OSA) is required. If you are eligible to receive an accommodation and would like to request it for a course, please discuss it with an OSA staff member and allow at least one week's advanced notice. Students who have questions about receiving accommodations, or those who have, or think they may have, a disability (mobility, sensory, health, psychological, learning, etc.) are invited to contact the OSA is located in the Student Services Building, suite 3.200. They can be reached by phone at (972) 883-2098, or by email at disabilityservice@utdallas.edu.

UT Dallas Syllabus Policies and Procedures:

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to http://go.utdallas.edu/syllabus-policies

Disclaimer:

This syllabus is provided for student convenience and is based on the most recent information available. There is no guarantee that the information is 100% accurate. If you have special concerns about course information, you are advised to contact the instructor.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.