EGM 4853: Bio-Fluid Mechanics and Bio-Heat Transfer
Department of Mechanical and Aerospace Engineering

Modifications to this syllabus may be required during the semester. Any changes to the syllabus will be posted on announced in class and on CANVAS.

Lecture times and days: 3rd Period (9:25-10:30 am) MWF. This course is 100% online. Most lectures will be pre-recorded. Office hours and Exams will occur during scheduled class times.

Live Zoom Class/Office hours: Biofluids Zoom Link

Prerecorded Classes: See this page

Class Web Site: CANVAS

Instructor: Dr. Malisa Sarntinoranont

Office Phone: 392-8404

E-mail: msarnt@ufl.edu

Office Hours: Mon & Wed: 9:35-10:30 am (Canvas Zoom)

or by appointment

Catalog Description: Credits: 3; Study of biothermal and fluid sciences. Emphasis on physiological processes occurring in human blood circulation and underlying mechanisms from an engineering prospective.

Pre-requisites and Co-requisites: *EGN 3353C Fluid Mechanics or equivalent course*

Textbook: Transport Phenomena in Biological Systems, 2nd Ed., G.A. Truskey, F. Yuan, D.F. Katz, Pearson Prentice Hall, 2009

Course Objectives: The objective of this course is to provide students with the necessary background in biofluid and thermal sciences in order to allow them to better understand the physiological processes that occur in the human body and analyze the physical mechanisms that underlie them. It stresses fundamental engineering science principles applied to physiological processes. Students will learn to apply the conservation equations to control volumes and express them through mathematical formulations, with emphasis on biological systems. Upon completion of this course, students are expected to understand basic fluid mechanical and heat transfer solution techniques, coupled with a strong foundation and appreciation for the underlying biology and physics of physiological processes.

Contribution of course to meeting the professional component:

EGM 4853 supports several program outcomes enumerated in the Mission Statement of the Department of Mechanical and Aerospace Engineering. Specific ME program outcomes supported by this course include: (1) Using knowledge of chemistry and calculus-based physics with depth in at least one of them; (2) Using knowledge of advanced mathematics through multivariate calculus and differential equations; (3) Being able to work professionally in the thermal systems area.

Relation to Program Outcomes (ABET):

This course achieves the following ABET outcomes [note that the outcome number corresponds to the respective ABET outcomes (a) through (k):
(a) Apply knowledge of mathematics, science, and engineering **[high coverage; method of assessment is homework, exams, homework and/or a specially-designed project to measure Outcome (a)]**
(e) Identify, formulate, and solve engineering Problems **[high coverage; method of assessment is homework, exams, homework problems and/or a specially-designed project to measure Outcome (e)]**
(i) Recognize the need for, and engage in life long learning **[low coverage; method of assessment are certain homework problems that go beyond the scope of the book and a specially-designed project measure Outcome (o)]**
(k) Use the techniques, skills, and modern engineering tools necessary for engineering practice **[low coverage; method of assessment is homework and three exams and/or a specially-designed project to measure Outcome (k)].**

Assessment Methods: Your grade for this course will be determined based on your performance on homework and exams as follows:

Homework	25%
Exam #1	25%
Exam #2	25%
Project/Review Paper	25%

- There will be no final exam.
- Late homework will be deducted 10% each day late. (No late homeworks accepted for those due right before an exam since solutions will be posted early).
- Working in groups is permitted and encouraged. However, copying homework is NOT permitted. *Use of solution manuals to complete homework is considered cheating and a violation of the honor policy, and this policy will be fully enforced.*

Final project: A final project will be due during the term. It will be assigned in the 2nd half of the class.

Proposed Grading:

93 - 100 = A
90 - 92.9 = A-
87 - 89.9 = B+
83 - 86.9 = B
80 - 82.9 = B-
77 - 79.9 = C+
73 - 76.9 = C
70 - 72.9 = C-
67 - 69.9 = D+
63 - 66.9 = D
60 - 62.9 = D-
<60 = F

REMARKS: Students are responsible for knowledge of all scheduling and policy announcements made in class.

Class Schedule

Wk.	Topic	Chapter
1	Overview of human body	1
2	Cardiovascular system	1
3	Physical/Mechanical properties of Circulation	2
4	Fluid mechanics of blood flow	2
5	Flow in Arteries & Veins	3
6	Flow in Arteries & Veins	5
7	**Exam 1**	1-3, 5
8	Microcirculation	2
9	Flow in the heart	5
10	Respiratory system	
11	Heat Transfer review	Supplement
12	Thermal modeling & Body temperature regulation	Supplement
13	Bioheat equation	Supplement
14	**Exam 2**	
15	Current topics	
16	**Project/paper due**	
	No Final	

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Academic Honesty: UF students are bound by The Honor Pledge which states

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code.

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "

On my honor, I have neither given nor received unauthorized aid in doing this assignment

The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class. If you have any concerns, please consult with Dr. Sarntinoranont at anytime during the course.

Course evaluations: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online *via* GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Software Use: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and peers to the highest standards of honesty and integrity.

Student Privacy: There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information see:http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

Accommodations for Disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Commitment to a safe and inclusive learning environment: The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator (Dr. Sarntinoranont)
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

Sexual Discrimination, Harassment, Assault, or Violence: If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Campus Resources

Health and Wellness

U Matter, We Care: Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS) at Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall*,* 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.

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