

BME6938 Vascular Bioengineering

Class Periods: MWF, Period 5, 11:45 am – 12:35 pm

Location: Online

Instructors: W. Lee Murfee, wmurfee@bme.ufl.edu, 352-294-8813

Office Hours: COME SEE ME!!!

(Note: The intent of the course schedule is that discussions and student questions can be answered during class time. Also, students can always contact Dr. Murfee via email and set up additional meetings outside class time. Dr. Murfee will do his best to be available.)

Class Sessions: Class will be online via Zoom sessions.

(Zoom link: <https://ufl.zoom.us/j/95218848923>)

(Zoom Meeting ID: 952 1884 8923)

Course Description

The objectives of this graduate-level course are to familiarize students with contemporary research areas that cover the field of vascular biology modalities. Example topics include smooth muscle cell and endothelial cell lineage, leukocyte-endothelial cell interactions, angiogenesis, drug targeting via the microcirculation, neural vascular control, atherosclerosis, and hypertension. These topics will be presented in the context of four overarching sections: 1) Vascular Cell Biology; 2) Principles of Vascular Design; 3) Vascular Pathophysiology, and 4) Therapeutic Design. For each section of the course students will be required to read, critically analyze, and present relevant articles. The course will culminate by highlighting how our basic understanding of physiological function/dysfunction can be translated to therapeutic design.

Course Pre-Requisites / Co-Requisites

BME graduate student status or permission from the instructor.

Course Specific Aims

1. Students will become familiar with current research in the field of vascular biology.

Students will be able to describe important questions that motivate specific research.

2. Students will learn the importance of cell-cell interactions for microvascular function.

Students will understand the role of endothelial cell-endothelial cell, endothelial cell-smooth muscle cell, and endothelial cell-leukocyte interactions for normal vascular function.

3. Students will be able to identify common cellular dynamics/structure/interactions across physiological systems.

Students will be able to provide examples of overlapping cellular dynamics during atherosclerosis, tumor growth, and hypertension. Students will also be able to provide examples of vascular-neural interactions, the role of inflammation in microvascular growth, and the interaction of vascular cells with their local interstitial environment.

4. Students will be comfortable designing experiments to investigate or manipulate the vascular system.

Students will be able to explain detailed experimental methods for investigating vascular function and/or growth at the tissue, cell, and molecular level. Students will also be able to design appropriate experiments to assess potential therapies for vascular related pathological conditions.

Required Textbooks

No text book is required for the course.

Relation to Program Outcomes (ABET)

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
3. An ability to communicate effectively with a range of audiences	Medium
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Medium
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

*Coverage is given as high, medium, or low.

Student Professional Experiences for Program Outcomes (ABET)

- Students will be required to read, critically analyze, and present relevant articles in the context of current vascular research areas. Students will also be required to integrate information from the literature to establish a rationale for a given hypothesis and to design experiments to test a given hypothesis.
- During in class discussion, presentations and exam problems, students will be challenged to design experiments to investigate poorly understood vascular function/dynamics and assess vascular related therapies.
- The course will emphasize presentation and discussion of current research topics. Students will be responsible for critiquing recent journal articles from leading laboratories in the field and will be exposed to current questions driving specific areas of vascular biology research.

Course Topics (see course schedule for specific class dates, assignments, presentations and exams)

- 1) Vascular Cell Biology** (Endothelial Cell Biology, Smooth Muscle Cell Biology, Vascular Cell Lineage/Stem Cell Biology, Leukocyte-Endothelial Cell Interactions);
- 2) Principles of Vascular Design** (Vascular Design and Remodeling, Endothelial Cell Migration, Vascular Development, Neural-Vascular Cell Interactions);
- 3) Vascular Pathophysiology** (Tumor Angiogenesis, Atherosclerosis, Hypertension);
- 4) Therapeutic Design** (Cell Targets for Therapy, Growth Factor Targets for Therapy, Drug Vehicle Design, Drug Delivery Methods)

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is expected and noted by the instructor each class. Excess absences, class disruption, and lack of engagement will influence the class participation grade. Class participation constitutes 15% of the total course grade and will be based on attendance and the submission of in class activity deliverables. Late work will not be accepted. However, if there are any issues, just let me know. I understand the current scenario and will work with each student to accommodate any special circumstances. Exams may be made up if extenuating circumstances are discussed beforehand or due to medical/family emergency.

Evaluation of Grades

Assignment	Percentage of Final Grade
Class Participations/Assignments	30%
Paper Presentation	15%
Problem Presentation	20%
Midterm Exam	15%
Final Exam	18%
Course Evaluations	2%
TOTAL	100%

Student Paper Presentations: By the second week of the course, students will be divided into groups. Each group will be responsible for presenting one paper to the class. The classroom presentation must begin with a description of the context in which the paper is to be placed. Good papers are motivated by important problems in the field. Thus, you will be required to use a major review or class notes to identify the scope of the problem as an introduction to the presentation. You should then clearly state the hypothesis that is being tested and describe any key methods. Most importantly, the presentation must include a critique of the method, assessment of the strengths and weaknesses, and assessment of the overall contribution to the field. A brief topical outline should be presented at least one class in advance. The other members of the class are expected to have read the outline and the specific paper. Each student should be prepared to comment on the validity of the paper and challenge the presenters. The student groups not presenting will be required to summarize the motivation/significance of the paper and generate at least one question.

Student Problem Presentations: The course will culminate with student groups defending solutions to open ended problems. Problems might involve designing experiments or integration of the material learned in the course. Student groups will have one week to prepare.

Grading Policy

Final grades will be influenced by the class average, the guiding grade range below, and the instructor's discretion.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
≥92	90-91	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	< 60

Online Class 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.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://disability.ufl.edu/students/get-started/>) 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.

Course Evaluation

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/>.

University Honesty Policy

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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-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.

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
- 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@eng.ufl.edu

Software Use

All faculty, staff, and students 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 our 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, please see: <https://registrar.ufl.edu/ferpa.html>

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 so that the U Matter, We Care Team can reach out to the student in distress. 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 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

Sexual Assault Recovery Services (SARS)

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 support, 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://care.dso.ufl.edu>.

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