

Introduction to Biophotonics

EEE5216

Class Periods: Tu 7, Th 7-8

Location: Burlington 1105

Academic Term: Spring 2020

Instructor:

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Office Phone Number: (352) 846-0441

Office Hours: 3:00-5:00pm, Tuesdays, @ 221 Larsen Hall

Teaching Assistant/Peer Mentor/Supervised Teaching Student: None

Course Description

Introduction to the principles of optics, lasers and biology, the interaction of light with cells and tissues, and various optical imaging, sensing and activation techniques and their applications in biomedicine. (3 credits)

Course Pre-Requisites / Co-Requisites:

General Physics PHY 2049 or equivalent

Course Objectives

Biophotonics is the science of generating and harnessing light (photons) to image, detect and manipulate biological materials. The goal of this course is to provide an introduction to the principles of optics and lasers, the basics of biology, the interaction of light with cells and tissues, and the applications of various optical imaging and sensing techniques in biomedicine. This course is highly interdisciplinary and is suitable for graduate and upper-level undergraduate students. This course is also designed to bring together students with various engineering or physics backgrounds.

Materials and Supply Fees: N/A

Required Textbooks and Software

- Title: Biophotonics: Concepts and Applications
- Author: Gerd Keiser
- Publication date and edition: 2016, First Edition
- ISBN number: 978-9811009433

Recommended Materials

- Introduction to Biophotonics, Paras N. Prasad, 2003, Wiley
- Biomedical Optics: Principles and Imaging, L. V. Wang, H.-I. Wu, 2007, Wiley.
- Introduction to Modern Optics, Grant R. Fowles, 2nd ed., 1989, Dover Publications.
- Optical Imaging and Microscopy : Techniques and Advanced Systems, Peter Török and Fu-Jen Kao, 2004, Springer.
- Introduction to Biomedical Imaging, Andrew G. Webb, 2002, IEEE Press.
- Biophotonics International, available on line: <http://www.photonics.com/bio/>

Course Schedule

Week 1	Introduction Fundamentals Light and Matter
Week 2	Principles of Lasers, Current Laser Technology Nonlinear Optics
Week 3	Light-Matter Interactions Photobiology

Week 4	Basics of Biology
Week 5	Bioimaging: Principles of Optical Microscopy
Week 6	Fluorescence Microscopy
Week 7	Confocal Microscopy Diffusion Optical Tomography
Week 8	Multiphoton Microscopy Nonlinear Optical Imaging
Week 9	Optical Coherence Tomography
Week 10	MEMS Introduction MEMS-Based Bioimaging
Week 11	Bioimaging Applications: Cellular, Tissue and In Vivo Imaging
Week 12	Optical Sensors Fiber-Optic Sensors SPR Biosensors
Week 13	Laser Tweezers
Week 14	Terahertz Spectroscopy and Imaging

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance and Expectations - Attendance is required. Cell phones and other electronic devices are to be silenced. No text messaging during class or exams. Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>
Excused absences must be in compliance with university policies in the Graduate Catalog (<https://catalog.ufl.edu/graduate/regulations/>) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (10)	100 each	15%
Quizzes (6)	100 each	12%
Lab (1)	100	3%
Midterm Exam	100	25%
Final Exam	100	25%
Project	100	15%
Attendance	100	5%
		100%

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at: <https://catalog.ufl.edu/graduate/regulations/>

Students Requiring Accommodations

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.

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>.