

BioImaging, Bio 477H

Fall semester 2024

Credits: 4 hours

Tuesday and Thursdays at 1:00 – 4:00 pm (In-Person)

Integrated Sciences Building (ISB) Room 360

Instructor: Andrew Stephens, andrew.stephens@umass.edu

Online message or video call via Bioimaging 477H Microsoft Teams or Zoom

Appointment hours: 12-1 pm in Integrated Sciences Building (ISB) Room 360, or by request

TA: Michael Seifu Bahiru, mbahiru@umass.edu

Course Description

This course is an all seniors upper-level biology Course-based Undergraduate Research Experience (CURE) lab class. In the first half of class, we will learn how to use cells and microscopy. In the second half of class, we will work as a team on a novel research project. We will work as a team to learn Microscopy, Image Analysis, Data Management and Presentation, Cell Culture and Preparation for Imaging, and finally learn Experimental Technique (see Learning Objective below). The class/team's cumulative goal is to investigate and report novel data. This will come in the form of a final project report and eventually a whole class scientific publication.

Learning Objectives

Course materials, lectures, discussions, in-class activities are designed to help you:

- Use a microscope to capture brightfield and epifluorescence image/s of human cells.
- Perform human cell culture and prepare cells for imaging through many different means.
- Troubleshoot acquiring quantitative images.
- Quantify microscope images via image analysis.
- Manage and communicate data acquired from microscope images
- Ask and answer novel experimental investigations with proper controls.
- Communicate/present a final project report encompassing all learning objectives.
- Develop skills and behaviors to bridge the divide between university and a future job.

How this class can improve your C.V. and job applications

One major goal of this course will be to begin to transition your mindset from being a university student to being a team player in your future occupation. The tangible items that can aid this transition into the future professional school or occupation of your choice were previously mentioned above but more clearly summarized below.

- C.V. experience line items including microscopy, immunofluorescence, cell culture, molecular biology techniques, experimental design, data analysis, and data presentation.
- Prospect of a letter of recommendation (formal request and sufficient time required)
- Name on scientific publication

Our Class Attendance Agreements

Strong participation means completing learning activities, being actively involved in discussions, asking interesting questions, and demonstrating that you read and have thought about the material. Participation translates through showing curiosity about others' perspectives on an issue, demonstrating respect for others' opinions and ideas through acknowledging their view and asking for clarification when you aren't sure. We can teach you everything you need to know, but we need your help to understand what you do and do not know.

Attendance and active participation are 25% of your grade. Please inform me of excused absences as soon as possible and best if it can be before class, which include - illness, family matters, religious, university sanctioned, or other extenuating circumstances. Please communicate through email or Teams clearly stating if the absence is excused listing one of the categories above or unexcused and include the specific date being missed. We will then communicate or meet in person to discuss plans for make-up. Two unexcused absences are permitted. Any absences beyond two will require make-up assignments outside of class.

Make-up

There will be two Make-up days for those who miss class. The rest of the class will use these days to get more hands-on training and teaching in things they are interested in or to work on projects of interest.

Make-up assignments (asynchronous) will be available with prior planning to aid learning the same material that was missed for an in-person class (synchronous). If you are ill but feeling well enough, it may be possible for you to engage in the class remotely for Microsoft Teams.

Course Materials via Microsoft Teams (called Bioimaging 477H)

All course materials are available on the Bioimaging 477H Microsoft Teams site, which an invitation will be emailed to each student. Microsoft Teams can be opened in an internet browser, a desktop application, and also on mobile device application (mobile has less functionality). All direct information needed for the class will be posted onto Teams via Handouts in the form of posted PDFs and assignments both pre- and in-class. You should prepare for each class by reading the PDF handout before class and doing the pre-class assignment.

Why use Microsoft Teams? Teams provide assignments/surveys, chat, video conferencing, calendars, channel-based messaging and communication, data storage and integration (PDFs, Word, Excel, PowerPoint, Microscope images), as well as having other abilities we may access. Microsoft Teams is used by many major companies to do business and thus is another learning component of this course. Note: As the Instructor of the Bioimaging 477 Team I have access to all things posted on to this Team. I suggest you be courteous and professional to your Teammates online and in person which will impact your Participation assessment. Your fellow Teammates will grade you in this course as part of the Participation assessment.

What digital technology tools and equipment will you need for this course?

Optional but beneficial: It would be beneficial if you have a personal laptop computer for personal access to Teams and analysis software and a mouse which aids image analysis. However, this is not necessary as the class has 8 computers each which are attached to a microscope. For those who wish to have a laptop computer or mouse that do not currently have one for use during class, please communicate your need to us (we will specifically ask this question in the first day class poll). I will work hard to obtain one for you.

Teaching/Mentoring approach

A simple guide for early scientists to become an independent thinker and work in a lab setting.

Priority – When in lab, students should be focused on lab. This also includes time management and deciding the worthiest tasks to accomplish.

Think – Being mindful during experiments to either focus on a task at hand or to question or learn about a procedure to help the student realize, “why am I doing, what I am doing?”

Communicate – builds on the foundation of Think by forcing a student to ask and answer questions with others in lab. This allows for instructors to determine student comprehension.

Repeat – speaks to the importance of practicing to improve while acknowledging that failure is just a steppingstone to success. Repetition and recapitulation are key parts of science.

Use of Electronic Devices

Please put non-Teams notifications on your devices into silent mode for the duration of class. If there is a personal matter you need to handle, please step out of the classroom. Internet activity not related to the class should not occur in the classroom. To handle personal matters or to take a mental break please step out of the classroom to do things not related to the class. This idea of separating work and leisure is an important skill to develop for your future workplace behavior. Non-class related internet activity will result in loss of participation grade.

How will you be graded?

Assignment Grade Distribution

- 25% (Participation includes attendance, teamwork, and respect)
- 25% (Assignments includes pre-class, in-class, and quizzes)
 - Assignments will be to fill out questions that help solidify the current modules learning material. Quizzes will be used to assess comprehension of the material. The assignments and quizzes will be posted, handled, and graded on Teams.
- 25% (Midterm)
 - Open note take home exam with an entire class period for use of the microscope. The exam period is 5 days.
- 25% (Final Project, CURE data and written report)
 - A Final Project Written Report, Data folder organized in Teams, and PowerPoint log of microscope image data is due at the end of the CURE project.

Grading Scale

A = 90 – 100; B+ 87 – 89; B = 80 – 86; C+ 77 – 79; C = 70 – 76; D+ 67 – 69; D 60 – 66; F < 60

Academic Honesty Policy

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).

Accommodation Statement

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements. For further information, please visit Disability Services (<https://www.umass.edu/disability/>).

There are also a range of resources on campus, including:

- [Writing Center](http://www.umass.edu/writingcenter) - <http://www.umass.edu/writingcenter>
- [Learning Resource Center](http://www.umass.edu/lrc) - <http://www.umass.edu/lrc>
- [Student Success](https://www.umass.edu/studentsuccess/) - <https://www.umass.edu/studentsuccess/>
- [Center for Counseling and Psychological Health \(CCPH\)](http://www.umass.edu/counseling) - <http://www.umass.edu/counseling>
- [English as a Second Language \(ESL\) Program](http://www.umass.edu/esl) - <http://www.umass.edu/esl>

Names & Pronouns

Everyone has the right to be addressed by the name and pronouns that they use for themselves. You can indicate your preferred/chosen first name and pronouns on SPIRE.

To learn more read: [Intro Handout on Pronouns](#)

Title IX Statement

In accordance with Title IX of the Education Amendments of 1972 that prohibits gender-based discrimination in educational settings that receive federal funds, the University of Massachusetts Amherst is committed to providing a safe learning environment for all students, free from all forms of discrimination, including sexual assault, sexual harassment, domestic violence, dating violence, stalking, and retaliation. This includes interactions in person or online through digital platforms and social media. Title IX also protects against discrimination on the basis of pregnancy, childbirth, false pregnancy, miscarriage, abortion, or related conditions, including recovery. There are resources here on campus to support you. A summary of the available Title IX resources (confidential and non-confidential) can be found at the following link: <https://www.umass.edu/titleix/resources>. You do not need to make a formal report to access them. If you need immediate support, you are not alone. Free and confidential support is available 24 hours a day / 7 days a week / 365 days a year at the SASA Hotline 413-545-0800..

Course Schedule – subject to change during semester

Week	Class # and Date	Questions/themes we will explore this session:	Quick reminders
1	1. Sept 3	Learn your microscope	· Students Info Survey
	2. Sept 5	Transmitted light and alignment	· Assignments
2	3. Sept 10	Cameras, SNR, and calibration	· Assignments
	4. Sept 12	Numerical Aperture and resolution	· Assignments and Quiz
3	5. Sept 17	Fluorescence	· Assignments
	6. Sept 19	Fluorescence photobleaching	· Assignments and Quiz
4	7. Sept 24	Immunofluorescence procedure	· Assignments
	8. Sept 26	Immunofluorescence imaging	· Assignments and Quiz
5	9. Oct 1	Live cell imaging and cell culture	· Assignments
	10. Oct 3	Plasmid prep. and cell culture	· Assignments and Quiz
6	11. Oct 8	Transfection imaging/ Make-Up	· Midterm releases
	12. Oct 10	Midterm: dedicated in class time	Midterm due Fri midnight
7	Oct 15	NO CLASS: Monday schedule	
	13. Oct 17	CURE Intro	· CURE Project Groups
8	14. Oct 22	CURE Begins	
	15. Oct 24	CURE	
9	16. Oct 29	CURE	
	17. Oct 31	CURE	
10	Nov 5	NO CLASS: Election Day	· Go Vote
	18. Nov 7	CURE	
11	19. Nov 12	CURE	
	20. Nov 14	CURE	
12	21. Nov 19	CURE last week – prepare report	
	22. Nov 21	CURE last week – prepare report	

13	23. Nov 26	CURE written report DUE	
	Nov 28	THANKSGIVING: NO CLASS	
14	24. Dec 3	Neurobiology microscopy	
	25. Dec 5	Neurobiology microscopy	
15.	26. Dec 10	FLEXIBLE last day of class	
-	NO FINAL	THIS CLASS HAS NO FINAL	NO FINAL