

August 19, 2005, Naohiro Kato

Syllabus: Fall 2005 BIOLOGICAL SCIENCES 7800 Section 3
Bioimaging - Live Cell Imaging and Digital Image Handling

Call Number: 0823

Course Number: BIOL7800

Section Number: 3

Course Type: Lecture and Laboratory, 3 credit hours

Course Title: Bioimaging - Live Cell Imaging and Digital Image Handling

Enrollment Limit: 10

Meeting Days and Time: Tuesday and Thursday 12 : 10 pm – 1 : 30 pm

Meeting Rooms: 0119 Tureaud Hall

Instructor: Naohiro Kato, Ph.D.

Assistant Professor, the Department of Biological Sciences, LSU

Office: Room 226, Life Sciences Building, LSU, Baton Rouge, LA

Office Hours: Friday 9 am – 12 pm (a small message board is available on the office door in case of absence) or By Appointments

Office Phone: 578-225-2004

Email: kato@LSU.edu

Website: http://www.biology.lsu.edu/faculty_listings/fac_pages/nkato.html

Contact Policy: Email is recommended.

Teaching Assistant: Glen Meades, Jr.

Graduate Student, the Department of Biological Sciences, LSU

Lab: 507 Choppin Hall

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Digital images can tell not only the shape and colors of the objects but also biochemical reactions in them. Recent developments in digital imaging technology have changed the way to analyze and present biological images. The images are pixilated with binary coded data so that researchers can accurately compare light intensity differences in the various areas of the images. The images are easily shared in different forms, such as prints, PowerPoint presentations, and websites. Many scientific publishers now require so called “electronic submission”. *It is necessary in the modern science society of today to understand the digital imaging technologies from data acquisition to publication.*

Course Objective:

The objective is to understand live cell imaging technology from the acquisition to the presentation. At the end of the course, students will be able to 1) design molecular tools, 2) analyze the images, and 3) format the data for publication and sharing.

Course Description:

Class will be held as a lecture as well as a hands-on experimental session. After the students learn digital image handling and methods to measure biochemical reactions in

live cells (focusing on protein-protein interactions), they will conduct a project to identify protein-protein interactions in live cells. Each student will receive DNA that encodes a different protein that may or may not interact with each other. The goal of the project will be to identify partners of the protein, using bioimaging techniques, among the proteins other students have. The individual students will present the result of the project in the class using PowerPoint and printed materials. The results will be also posted on a website.

Prerequisites:

Basic knowledge of cell and molecular biology such as functions of cellular components and DNA cloning techniques. BIOL 3090, Cell Biology or equivalent. Contact the instructor kato@LSU.edu before registration if your qualification is not certain.

Required Purchases:

None

Course Resources:

Recommended Internet Sites:

<http://www.microscopy.fsu.edu>

Recommended Textbook:

Live Cell Imaging A Laboratory Manual, Edited By Robert D. Goldman and David L. Spector, Copyright 2005, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, ICBN 0879696834. (**No need** to purchase the textbook for this particular course.)

Course Materials:

Live Cells, DNA, fluorescence microscopes, digital cameras, personal computers, imaging software, internet accesses, book chapters, and scientific journals. All physical materials will be provided in the class. All digital materials will be provided through Blackboard.

Course Management System:

Announcements will be made in class as well as on Blackboard.

Resister your name in the BlackBoard system at <http://blackboard.lsu.edu> before the first class begins. Visit Blackboard between each class session.

Research and Session Assignment:

The research assignment is to study a protein that will be assigned by the instructor for the research project. All students must present scientific papers that describe the protein so that other students can predict their partners through class discussions before the project begins. Active readings and internet searches outside class will be required. Preparative and supportive assignments for each class session, such as reading scientific papers, searching applications in daily life, memorizing terminology, and analyzing images on computers also will be given.

Research Project:

The students will conduct a research project. The proteins given for the research assignment will be used to identify their partners in live cells during the course. The students will present the results in three formats (prints, PowerPoint, and website).

Grading Polices:

Grading is absolute but not on a curve. Extra credit assignments are not given. Midterm and Final examination will be given in the classroom. Exams will have short answer and essay type questions. Make-up exams will only be given when official paper documentation is provided that clearly indicates circumstances beyond a student's control. A note from a friend or family member is not acceptable documentation.

The final grade will be based on 400 points.

Midterm Exam: 100 points

Final Exam: 100 points

Research Project: 100 points

Assignment: 50 points

Attendance: 50 points

Your final grade will be based on your cumulative percentage using the scale below:

%	100-90	89-80	79-65	64-50	< 50
Grade	A	B	C	D	F

Course Legal Statements:

Withdraw:

A student may withdraw from the class on and before August 24, 2005 without receiving a grade of "W". A student withdrawing from the class on and before November 4, 2005 will receive a grade of "W".

Equal Opportunity:

All qualified students have equal opportunity in class without regard to race, creed, color, marital status, sexual orientation, religion, sex, national origin, age, or veteran's status.

Disabilities:

A student having learning disabilities should consult the instructor and Office of Disability Services (<http://appl003.ocs.lsu.edu/slas/ods.nsf/TextOnly>) before registration.

Academic Integrity and Civility:

Code of Student Conduct issued by the Office of the Chancellor

([http://appl003.lsu.edu/slas/judicialaffairs.nsf/\\$Content/Code+of+Student+Conduct?OpenDocument#5.1](http://appl003.lsu.edu/slas/judicialaffairs.nsf/$Content/Code+of+Student+Conduct?OpenDocument#5.1)) will be applied.

Memo:

Schedule:

Session	Date	Topics	Hands-on	Lecture	Research Note
1	8/23 Tu	Introduction I		Course Description	
2	8/25 Th	Introduction II	Live cell observation	Principal	
3	8/30 Tu	Fluorescent Probe I		Detection Systems	
4	9/1 Th	Fluorescent Probe II		Optics and Data Processing	
5	9/6 Tu	Fluorescence Microscope		Detection of Biochemical Reactions in Live Cells	
6	9/8 Th	Cellular Functions I		Protein-protein interactions	Announce Assignment
7	9/13 Tu	Cellular Functions II		Experimental design	
8	9/15 Th	Cellular Functions III		Internet database	
9	9/20 Tu	Cellular Functions IV		Principal	
10	9/22 Th	Digital Imaging I			
11	9/27 Tu	Digital Imaging II	ImageJ and Photoshop		
12	9/29 Th	Digital Imaging III	Image handling I, analysis		
13	10/6 Tu	Digital Imaging IV	Image handling II, printing		
14	10/7 Th	Digital Imaging V	Image handling III, PowerPoint, Web		
	10/11 Tu	Fall Holiday			
	10/13 Th	Mid-semester Exam			
15	10/18 Tu	Journal Club I		Students present research papers	Assignment Deadline
16	10/20 Th	Journal Club II		Students present research papers	
17	10/25 Tu	Journal Club III		Discussion	
18	10/27 Th	Live Cell Imaging I	Preparation I		Start Research Project
19	11/1 Tu	Live Cell Imaging II	Preparation II		
20	11/3 Th	Live Cell Imaging III	Data collection I		
21	11/8 Tu	Live Cell Imaging IV	Data analysis I		
22	11/10 Th	Live Cells Imaging V	Cell Transformation		
23	11/15 Tu	Live Cells Imaging VI	Data collection II		
24	11/17 Th	Live Cells Imaging VII	Data analysis II		
	11/22 Tu	Final Exam			
25	11/24 Th	Thanksgiving Holiday		Students present the project results	
	11/29 Tu	Presentation I			
26	12/1 Th	Presentation II		Students present the project results	End Research Project