

Models Systems of Genetic Disorders – GGSC490/GGSC690
Syllabus, Course Objectives and Policies
Fall Semester 2019

Credit hours: 3.0

Room: Education Building, Rm 237

Dates & Times: MWF 11:15 - 12:05

Instructor:

Dr. Kasturi Mitra (Faculty Instructor and (Lab project instructor for Drosophila model)

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Benjamin Wildman (Teaching Fellow)

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Office: Kaul 740B (Faculty Instructor)

Office hours: MT: 10:00-11:00 am

Course Objectives: This course will focus on use of animal models in understanding the underlying genetic factors associated with disorders and disease states in humans. Through reading and reviewing scientific literature, we will explore the usage of animal models to understand gene function as it relates to genetic disorders. Topics covered, but not limited to, include cancer, aging, neurodegenerative diseases, rare diseases and others. All materials will be posted on Canvas and you are expected to come to class having read assigned materials and ready for discussion. We will be hearing from various guest lecturers (UAB faculty) to learn how different model systems are utilized in human disease research. To enable hands on experience, we will perform well planned laboratory experiments on chosen model organisms through the duration of the course. Also, we will be touring facilities relevant to model organism research.

Course Goals:

- Refresher of classical and modern genetics concepts.
- Understand why model systems are useful in investigating human genetic disorders
- Conceptualize the genetic relationship amongst eukaryotic organisms and concepts relating to genetic conservation.
- Examine the benefits and considerations for working with various model organisms.
- Determine how to ask a testable research question utilizing animal models
- Perform experiments using model organisms.
- Develop clear written and oral communication skills.
- Improve skills of working on a team and reflecting on your own strengths and weaknesses.

Student expectations:

- Arrive to class on time and ready to learn.
- Read all assigned materials and complete all homework, prior to class.

- Ask questions, share your thoughts on readings and be a willing participant in discussions and team work.
- Respect yourself, your peers and all faculty.
- Submit assignments on time.

Recommended textbook: Molecular Biology of the Cell, 6th ed., Alberts *et al.* Garland Sciences.

Grading:

Letter Grade: 90-100%ile =A; 80-89%ile =B; 70-79%ile =C; 60-69%ile =D; <60%ile =F

Categories	Points
Attendance	10
(1 unexcused absence allowed, 2 pts will be deducted with each consecutive Unexcused absence. 2 excused absences allowed)	
Class participation	
Which model organism are you?	3
Introduction quiz	2
Questions / clarifications to the instructor	20
Team participation	10+10
Assignments	
Crossword	25
Lab project choice	10
Midterm essay	150
Choice of paper non-traditional model journal club*	10
Zebrafish facility visit assignment	10
Mouse facility assignment	10
Group presentations**	
Journal club on non-traditional model	30
Lab research	100
Final exam quiz***	300
Total course points	700

* Assignments graded as a group

** Impact of the presentations graded as a group, while presentation skills graded as individuals.

*** 50% of the quiz questions will be set from the interactions in class.

Additional assignments for 690 level

1. Thesis on lab project 200
(no more than 6 pages, Rubric will be provided and discussed in detail one on one)
2. Extra questions in final quiz based on journal clubs. 100

Reading assignments: Throughout the semester you will be expected to read in depth about a variety of topics relating how to model genetic disorders and disease. Reading assignments will be posted via Canvas and you will need to complete all readings prior to the beginning of class. The reading materials include the following categories:

- a) 'Genetics overview' will prepare you for the crossword assignment.
- b) Overview papers will prepare you particularly for lab project (and its related assignment) and Mid-term essay
- c) Impact papers will give you an idea of breakthrough discoveries using model organisms.
- d) Reading papers will prepare you for the journal club discussions.

Assignments to be submitted on mentioned due dates:

1. Lab project choice: You will choose between the two debated model organisms and justify your choice. Rubric will be provided. The labs will be assigned based on your justified choice.
2. Midterm exam: You will prepare to write an essay on your choice of a human disorder and a model organism to model your chosen disease. You will write the essay in class. Rubric will be provided during the test.
3. Journal club paper for non-traditional model: As a group, you will choose a paper on any model that has not been included in the syllabus. The paper can either model a disease or a fundamental discovery relevant for disease. You will give a journal club style presentation on this paper. Your presentation date will be assigned according to your choice on a 'first come first serve' basis.
4. Essay on facility tours: In order to gain a deeper understanding as to what it is like to conduct research on various model systems we will be visiting the zebrafish and mice housing facilities. During these tours you will learn about animal husbandry and various technical details about maintaining the laboratory animals. You will be expected to be attentive and ask questions and obtain information regarding various animal models. You will write what you have learned in the tours and aspects of the model organism you liked best. This is a personal essay in your own style. No rubric will be provided.
5. Crossword: Will be based on "Genetics overview" reading assignment.

Presentations*:

1. Lab updates: You will share what you have learned in your ongoing lab project. Rubric will be provided. This will be a practice for your lab work presentation as a part of the finals.
2. Group journal club presentation on non-traditional model: As a group you will present the paper that you have chosen. Rubric will be provided.

- 3. Lab work presentation:** As a part of the final exam, you will present your lab research work as a group. You will be expected to use the rubric for the 'Lab Updates', while you may choose to improve it with the objective of communicating your research goals, methods and findings. You may use your knowledge that you have learned during the course through various presentations including yours.

* The time slots of the presentation will be decided based on the number of groups.

Review before exams: You will get an opportunity to ask questions to clarify your understanding on any topic covered during the course. This will be done openly in class so that everybody can take advantage of it.

Exams:

Midterm: See Assignment

Final (490):

Presentation: See Presentations

Quiz: You will answer 60 questions (multiple choice or short answer) of 5 point each within the designated hour.

Final (690):

Additional Quiz: You will answer additional 20 questions of 5 points each within the designated hour.

Laboratory project: You will do your laboratory group project under supervision. You will be expected to read overview papers of the model organism of your choice before the laboratory project begins. You will be taught experimental techniques that you will perform as a group or individually. You will be required to finish the online training on RCR (link below) and submit a copy of your certificate to me by email before the first laboratory class. Taking notes in each lab is strongly encouraged. The lab instructors will be available by email for any clarifications or reviewing of materials. Any novel research finding directly resulting out of your research endeavors will be given due credit.

<https://www.uab.edu/undergraduateresearch/training>

Missed classes/make-up assignments: If it is absolutely necessary or you are too ill to be present in class, you should notify me immediately about your absence, prior to the start of the class. If you have an acceptable excuse and have notified me, prior to your absence, we will work out the best option for you to make up an assignment or turn in work at a later time. All speakers and tours will not be available at a later time.

Audio recording, videotaping or photographing class lectures: In general, any form of audio and/or video capture of lectures is not permitted except with written consent of the instructor (with justification).

Electronic Devices in the Classroom: All cell phones should be silenced and removed from the desk top at the beginning of class. Utilization of laptops, tablets, or other electronic devices for classroom related activities is permitted. Use of these devices and other devices (cell phones, iPod's, etc.) for other activities such as searching the internet, checking email, or reviewing material unrelated to class is not permitted during class.

Class Attendance: Attendance at all lectures is expected and highly recommended. The majority of test and quiz questions will be derived from material discussed during lectures.

Academic Misconduct: Students are expected to maintain an acceptable quality of academic performance and to exhibit appropriate conduct. Students are expected to conduct themselves in a manner similar to accepted standards for practicing health care professionals. Academic misconduct may include, but is not necessarily limited to, acts such as plagiarism, cheating, misrepresentation, fabrication or giving or receiving unauthorized aid in tests, examinations, or other assigned work, and will be subject to disciplinary action. Any act of dishonesty in academic work constitutes academic misconduct. Academic misconduct will result in a grade of zero on the assignment/exam and may result in disciplinary action. A student who feels he or she has been unfairly disciplined should contact the program director or department chair to request a review of the disciplinary decision. A more detailed description of the *Grievance Procedures for Violations of Academic Standards* is available from the Office of the Associate Dean for Academic and Student Affairs.

Special Needs: If you have registered with the UAB DSS, please let me know ASAP if you have any concerns regarding the availability of accommodations that may be necessary, and to complete any necessary paperwork. You are expected to complete the exams on the scheduled exam dates, unless otherwise determined. DSS contact email: dss@uab.edu

TITLE IX: The University of Alabama at Birmingham is committed to providing an environment that is free of bias, discrimination, and harassment. If you have been the victim of sexual discrimination, harassment, misconduct, or assault we encourage you to report the incident. UAB provides several avenues for reporting. For more information about Title IX, policy, reporting, protections, resources and supports, please visit [UAB's Title IX Policy](#) and [UAB's Equal Opportunity and Anti-Harassment Policy](#).

Course Schedule: See next page.

Date	Lecture Topic	Readings	Assignments due
Aug. 26 M	Introduction, syllabus, ASCB quiz	Genetics overview	
Aug. 28 W	Refresher of basic genetics / genomics concepts		
Aug. 30 F	Model system comparisons		
Sept. 2 M	Labor Day - no class		
Sept. 4 W	Nobel award winning model organism work	Video	
Sept. 6 F	Bacteria and Yeast		
Sept. 9 M	Fly	Overview paper	
Sept. 11 W	Worm by Dr. Melissa LaBonty	Overview paper	
Sept. 13 F	Debate: Fly (Mitra) vs Worm (LaBonty)		
Sept. 16 M	Zebra fish by Dr. Matt Alexander	Impact paper	Lab project choice
Sept. 18 W	Tour of the zebrafish facility Dr. Susan Farmer		
Sept. 20 F	Reading a research paper for Journal Club		
Sept. 23 M	Frog- Dr. Heather Ray	Reading Paper	Essay on facility tour
Sept. 25 W	Frog- Dr. Heather Ray		
Sept. 27 F	Lab (Fly or Worm)		
Sept 30 M	Chick	Impact paper, Video	
Oct. 2 W	Stem cells and organoids	Impact Paper	
Oct. 4 F	CRISPR and Transgenics by Dr. Laura Lambert	Impact Paper	
Oct. 7 M	Cancer models	Overview paper	
Oct. 9 W	Neurobiology models	Overview paper	
Oct. 11 F	Lab (Fly or Worm)		
Oct. 14 M	Aging models	Overview paper	
Oct. 16 W	Review for midterm		
Oct. 18 F	MIDTERM EXAM		Essay (choose a disease and an organism to model it)
Oct. 21 M	Lab updates		
Oct. 23 W	Optogenetics and Brainbow mouse models	Impact Paper	
Oct. 25 F	Lab (Fly or Worm)		Submit the paper for non-traditional model
Oct. 28 M	Pathway comparison between model organisms		
Oct. 30 W	Developing model for rare / undiagnosed disease		
Nov. 1 F	Journal club discussion on non-traditional model		Student Presentation
Nov. 4 M	Journal club discussion on non-traditional model		Student Presentation
Nov. 6 W	Journal club discussion on non-traditional model		Student Presentation
Nov. 8 F	Lab (Fly or Worm)		
Nov. 11 M	Mouse by Dr. Daniel Bullard	Impact Paper	
Nov. 13 W	Mouse by Dr. Susan Farmer	Impact Paper	
Nov. 15 F	Tour of the mouse facility by Dr. Susan Farmer		
Nov 18 M	Journal Club on mouse model for nuclear genetics	Reading Paper	Essay on facility tour
Nov. 20 W	Journal Club on mouse model for mitochondrial genetics	Reading Paper	
Nov. 22 F	Lab (Fly or Worm)		
Nov. 25-Dec 1	Thanksgiving Break - no class		
Dec. 2 M	Comparison of Rat and Mouse models	Reading Paper	
Dec. 4 W	Lab wrap up (Fly or Worm)		
Dec. 6 F	Review for final exam		Crossword
Dec. 9 M	FINAL EXAM		Lab work presentation and quizzes

