

Molecular Genetics - STH201
Syllabus, Course Objectives and Policies
Spring semester 2019

Credit hours: 3.0

Room: Community Health Services Building (CH19) room 503

Dates & Times: MW 4:45 - 6:45 pm

Instructor: Dr. Camerron M. Crowder

Email: Camerron@uab.edu

Course Objectives: This laboratory-based course will introduce students to the world of molecular biology research by utilizing the CRISPR-Cas9 genome engineering system. Course participants will design and construct CRISPR guide RNA to target specific gene sequences in the zebrafish genome. This semester we will be partnering with Dr. Matt Might, director of the Hugh Kaul Precision Medicine Institute, to target genes associated with rare human diseases with the goal of developing zebrafish models of human disease. In order to achieve this goal, we will be inducing mutations in homologous genes, designing and validating CRISPR guide RNA targeting these genes, testing the efficiency of these targets to impair protein function and examining phenotypes resulting from mutations. Students will gain an understanding of the underlying genetic factors associated with disorders and disease states in humans and the importance of animal models in research. Through reading and reviewing scientific literature, we will explore the usage of animal models to understand gene function as it relates to genetic disorders. Learning molecular genetics in an active authentic lab-based learning environment is a unique opportunity to experience life as a scientific researcher!

Course Goals:

- Understand why model systems are useful in investigating human genetic disorders
- Learn the CRISPR-Cas9 gene engineering technology
- Develop key skills in molecular biology laboratory research
- Conceptualize the genetic relationship amongst eukaryotic organisms and concepts relating to genetic conservation
- Determine how to ask a testable research question utilizing animal models
- 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

Grading:

Assignments	Points
Journal club assignments (10 pts. each x 2)	20
Quizzes (20 pts. each x 3)	60
Bioinformatics assignment (Benchling)	10
Gene specific literature summaries (3 summaries)	15
Group presentation on genetic disorder and gene of interest (rubric)*	15
Group poster presentation (rubric)*	15
Lab tour assignment	10
Laboratory notebook checks (15 pts. each x2)	30
Final exam	50
Total course points	225

* Assignments graded as a group

Journal club assignments: Throughout the semester you will be expected to read in depth about a variety of topics relating to CRISPR-Cas9 genome engineering, 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. Journal club assignments (2 assignments total - 10 pts each) will be **due prior to class** and printed out and brought with you to class. As a class and in small groups we will discuss the readings to gain a deeper understanding of the material, for participation it is required that you have completed readings and assignments.

Quizzes: Three 20-point quizzes will be administered at the beginning of the class throughout the semester. Quizzes are intended to assess your learning and to encourage you to keep up and study the materials in preparation for the final exam. Quizzes are all short answer and you will be required to write out terms, disorders or genetic concepts covered in lectures, speaker presentations and group work assignments.

Group presentation on individual genes and genetic disorders: Working in small groups (2-3 students) you will select a gene associated with a human genetic disorder from a selected group of genes. Together you will examine this gene's homolog within the zebrafish genome and examine/research gene structure and function. You will work with your team members to identify a research question associated with your gene/genetic disorder and hypothesize about potential phenotypes you might see by mutating (preventing protein synthesis) of this particular gene, given the disease symptoms of the human genetic disorder. Together as a group you will present your individual gene (structure, domains, exons, function), research question, CRISPR target sites and expected phenotypes.

Lab tour assignment: In order to gain a deeper understanding as to what it is like to conduct research using zebrafish we will be visiting the zebrafish housing facilities. During this facility tour you will be expected to ask questions and obtain information regarding working with zebrafish. You will answer questions for a short worksheet assignment (10 pts) that you will turn in to me.

Final exam: A cumulative-final exam (50 pts) will be held in class at end of the semester. Exam will include multiple choice, short answer, long answer and labeling type questions. A review will be held in class prior to the exam where you will be expected to ask questions, draw out and label cellular and molecular events and discuss topics openly to prepare for the exams.

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

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 classes is expected and highly recommended. The majority of test and quiz questions will be derived from material discussed during class.

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. 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](#)

CURE STH201 syllabus ideas

Date	Lecture Topic	Readings	Assignments
Jan. 7 M	Introduction, syllabus, game plan	Assign background reading	DNA models
Jan. 9 W	Molecular biology (L J) + methods lecture (JG)		TransX models
Jan. 14 M	Dr. Matt Might - invited speaker	Assign background reading	
Jan. 16 W	Gene homology overview + gene selection		Quiz 1
Jan. 21 M	Martin Luther King holiday - no class	Extract DNA from embryos	
Jan. 23 W	Bioinformatics I, genome browser, team assign.	Assign JC1	Benchling
Jan. 28 M	Bioinformatics II, bench work flow chart, PCR	lab tour + stations	Quiz 2
Jan. 30 W	JC1 + research questions exercise		
Feb. 4 M	Introduction to the lab + pipette rodeo + ?'s	lab stations, gel demo	
Feb. 6 W	Medicam + protein structure + literature search	literature search	
Feb. 11 M	<i>In-vitro</i> transcription I, sgRNA synthesis		
Feb. 13 W	<i>In-vitro</i> transcription II	Assign JC2	
Feb. 18 M	DNase treatment + RNA purification, Quiz 3	Notebook check 1	Quiz 3
Feb. 20 W	PAGE gel, Journal club 2, make primers	Embryo injections	Journal club 2
Feb. 25 M	Zebrafish facility tour	Lab tour assignment	
Feb. 27 W	PCR + Nuclease assay I + PAGE gels	3 paper summaries due	LT assign. due
Mar. 4 M	Nuclease assay II + Group presentations on genes		Notebook check
Mar. 6 W	PAGE gels + Quiz 4 + survey		Quiz 4
Mar. 11-17	Spring Break - no class	Sunday Microinjection (3/17)	
Mar. 18 M	Phenotyping embryos, microscopy, poster prep.	Examine 24h phenotypes (10)	
Mar. 20 W	Phenotyping embryos, microscopy, poster prep.	Examine 48h phenotypes (10)	
Mar. 25 M	Phenotyping embryos, microscopy, poster prep.	Sunday Microinjection (3/24)	
Mar. 27 W	Phenotyping embryos, microscopy, poster prep.	Examine 48h phenotypes (10)	
Apr. 1 M	Phenotyping embryos, microscopy, poster prep.		
Apr. 3 W	UAB Expo poster preparation	Submit posters for printing	Posters due
Apr. 8 M	UAB Expo poster presentation practice		
Apr. 10 W	UAB Expo poster presentation practice		
Apr. 13 F	UAB Expo poster presentations		
Apr. 15 M	Review for final exam + surveys		
Apr. 17 W	Final exam		
Apr. 22-16	Finals week		