Course Syllabus – BIOL 510

Course Information

Course Number: BIOL 510 SP21
Course Name: Genetics and Genomics
Term: SP 2021
Start Date: 04/05/2021
End Date: 06/25/2021
Credits: 3.0

Meeting Days / Times

Mondays and Wednesdays, 8:15-9:45am PST / 11:15am-12:45pm EST
(See Calendar in Canvas for the most up-to-date schedule.)

Location

Online via Zoom

Course Managers

Role	Last Name	First Name	Email Address
Instructor	Torkamani	Ali	atorkama@scripps.edu
TA	Chen	Shaun	sfchen@scripps.edu
TA	Grinman	Eddie	egrinman@scripps.edu

Course Description

This course is a survey of the major applications of genetics and genomics in research, with some emphasis on human disease research. This includes both genetic and genomic technologies for characterizing determinants of human health, as well as the various applications of genomic technologies for the global molecular characterization of and perturbation of model systems in research. Multiple layers of 'omics – from the genome, to epigenome, to the microbiome and pathogen genomes will be discussed. One lecture per week will be paired with one student-led journal club discussion. Students will be graded on their participation, presentations, a mid-term exam and a final exam.

Program Learning Outcomes

By the end of the program, students will have accomplished these objectives:
PLO1: Original Research – graduate students are expected to develop the skills critical for generating high-quality research output. This would include absorbing, recalling, and

contextualizing scientific knowledge, evaluating scientific information and data, creating testable hypotheses and investigating hypotheses, mastering scientific tools and techniques, displaying ethical behavior, and receiving and giving feedback.
PLO2: Communication – graduate students are expected to demonstrate the oral, written, and media skills to effectively communicate the impact of a study or a body of work to the greater scientific community and to the public at large using a number of methods.
PLO3: Critical Thinking – graduate students are expected to develop a self-directed process to analyze information, form opinions or judgments, and use this process to improve the quality of their scientific thoughts, navigate problems, and make informed decisions.
PLO4: Intellectual Curiosity – graduate students are expected to acquire the capacity to build their intellectual curiosity and demonstrate problem solving approaches that serve their professional growth and ability to impact a field.
PLO5: Career and Professional Development – graduate students are expected to develop a variety of transferable skillsets throughout their graduate experience, including management and leadership, inclusiveness, resilience, scientific rigor, collaboration, accountability, time management, teamwork, networking, and career planning.

Course Learning Outcomes

Upon completion of this course students will be able to:
CLO1: Know and understand the basic structure of the genome, genes, and regulatory features.
CLO2: Gain familiarity with the resources available for understanding the regulatory and genetic structure of specific genes or genomic regions of interest.
CLO3: Understand multiple strategies for mapping the genetic etiology of disease – from mapping common complex traits in large populations to identifying the genetic cause of disease in family based studies.
CLO4: Understand multiple strategies for characterizing gene function via genetic and functional genomic approaches.
CLO5: Be exposed to and understand the molecular phenomena that can be characterized via genomic assays and technology – including the transcriptome, epigenome, and microbiome.

Background Preparation (Prerequisites)

There are no prerequisites for this course. The course is intended to be an introduction to genetic and genomic methods. An introductory course in basic genetics and molecular biology is recommended.

Required Course Materials

N/A

Instructor Policies

The course is intended to expose and provide a basic understanding of the vast array of genetic and genomic techniques and resources available for biological research. The course is suitable for students of any background who wish to gain a familiarity with these topics. The intent is to come out with a good grasp of available resources and assays in order to form specific hypotheses in an area of interest or in order to apply the appropriate technique for characterization of cellular/animal models. Students are not expected to become experts in any of the topics covered during the course. Rather, students are expected to actively participate in lectures, by asking questions and making comments on topics discussed where details are unclear, in order to gain the maximum benefit of understanding and enable the student to integrate the various genomic techniques into a powerful toolbox of methods for biological inquiry.

Course Requirements

Grading will be based on weekly participation in journal article discussions (50%), a take home mid-term exam (20%), and take-home final exam (30%).

Attendance Statement

Students are expected to attend all classes. Students who are unable to attend class must seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for three or more classes may result in a lower grade or an "incomplete" for the course. If a student has to miss a class, he or she should arrange to get notes from a fellow student and is strongly encouraged to meet with the teaching assistant to obtain the missed material. Missed extra-credit quizzes will not be available for re-taking.

Scientific and Professional Ethics

The work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others' work and your own, ask the course professor who will give you clear guidance. Exams must be completed independently. Any collaboration on answers to exams, unless expressly permitted, may result in an automatic failing grade and possible expulsion from the Graduate Program.

Technology Requirements and Support

For issues related to Canvas, please contact the Graduate Office by email at: gradprgm@scripps.edu or by phone at: 858-784-8469.

Course Grading

Grading is in accordance with the academic policies of the Skaggs Graduate School. The breakdown of grading is as follows:

- Participation: 50%
- Midterm Exam: 20%
- Final Exam: 30%

Letter Grade	Percent	GPA	Description
A	93-100	4.00	Outstanding achievement. Student performance demonstrates full command of the course subject matter and evinces a high level of originality and/or creativity that far surpasses course expectations.
A-	90-92	3.67	Excellent achievement. Student performance demonstrates thorough knowledge of the course subject matter and exceeds course expectations by completing all requirements in a superior manner.
B+	87-89	3.33	Very good work. Student performance demonstrates above-average comprehension of the course subject matter and exceeds course expectations on all tasks as defined in the course syllabus. There is notable insight and originality.
B	83-86	3.00	Satisfactory work. Student performance meets designated course expectations and demonstrates understanding of the course subject matter at an acceptable level.
B-	80-82	2.67	Marginal work. Student performance demonstrates incomplete understanding of course subject matter. There is limited perception and originality.
C+	77-79	2.33	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
C	73-76	2.00	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
P	73-100	0.00	Satisfactory work. Student performance demonstrated complete and adequate understanding of course subject matter. Course will count toward degree.
F	0-72	0.00	Unacceptable work/Failure. Student performance is unacceptably low level of knowledge and understanding of course subject matter. Course will not count toward degree. Student may continue in program only with permission of the Dean.

I	0.00	Incomplete is assigned when work is of passing quality but is incomplete for a pre-approved reason. Once an incomplete grade is assigned, it remains on student's permanent record until a grade is awarded.
W	0.00	Withdrew from the course with Dean's permission beyond the second week of the term.

- All courses will be recorded and maintained in the student's permanent academic record; only courses that apply towards the degree will appear on the academic transcript. Non-credit or audited courses will not appear on the transcript.
- 4 core courses taken for a letter grade (pass = B- or higher for a core course)
- 2 elective courses taken pass/fail (pass = A, B, C for an elective)

Course Schedule:

Date	Details
Mon Apr 5, 2021	**Genes and the Genome (Ali Torkamani)**
Wed Apr 7, 2021	**Journal Club**
Mon Apr 12, 2021	**Meiotic Mapping and Genetic Linkage (Ali Torkamani)**
Wed Apr 14, 2021	**Journal Club**
Mon Apr 19, 2021	**Rare Variants and Genome Sequencing (Matthew Bainbridge)**
Wed Apr 21, 2021	**Journal Club**
Mon Apr 26, 2021	**Population Genetics (Nathan Wineinger)**
Wed Apr 28, 2021	**Journal Club**
Mon May 3, 2021	**Structural Variation (Jonathan Sebat)**
Wed May 5, 2021	**Journal Club**
Mon May 10, 2021	**Transcriptomics (Pejman Mohammadi)**
Wed May 12, 2021	**Journal Club**
Mon May 17, 2021	**Epigenomics (Bing Ren)**
Wed May 19, 2021	**Journal Club**
Mon May 24, 2021	**The Microbiome (TBD: Rob Knight)**
Wed May 26, 2021	**Journal Club**
Mon May 31, 2021	**Memorial Day (No Class)**
Wed Jun 2, 2021	**No Class**
Mon Jun 7, 2021	**Pathogen Genomics (Raphaelle Klitting)**
Wed Jun 9, 2021	**Journal Club**
Mon Jun 14, 2021	**Gene Editing (Aaron Smargon)**
Wed Jun 16, 2021	**Journal Club**