University of South Carolina **Department of Biology**

Chords and Codons, Biology 599, Spring 2022

Schedule: M/W 2:20-3:35 + TBA
Instructor: Dr. Jeff Dudycha; CLS 608; 777-3987; dudycha@biol.sc.edu
Collaborating Instructor: Dr. Reg Bain; SoM 227; 777-8183; rbain@mozart.sc.edu
Website: See BlackBoard.
Office Hours: By appointment.
Location: CLS 202 and Studio B (SoM Room 011). See schedule for location on specific dates.

Course summary: Students will learn mechanistic processes of genetics, with a particular focus on mutation. This is a project-based course in which teams of students will develop and implement music-based simulations of genetic and evolutionary processes. Students in this course will work on their main project in teams with music students enrolled in MUSC 540/(737), (Advanced) Projects in Computer Music.

Specific learning outcomes: Successful students will be able to...

a. ...describe and instruct others in basic genetic processes
b. ...explain basic aspects of computer music, algorithmic composition, sonification, and data-driven music
c. ...develop a plan of creative activity/research in consultation with the instructors
d. ...work collaboratively with individuals that have different areas of expertise
d. ...simulate biological processes in sound
e. ...document and maintain a record of creative scientific exploration
f. ...communicate scientific information through non-traditional means.

Pre-requisites: one 300-level Biology course and permission of the instructor.

Lectures, Discussion, and Project time: Lecture periods in this course are intended to provide the necessary background to understand genetic processes, the representation of data in sound, historical development of computer-based music, and existing work that seeks to implement computer music with biological information. The course will de divided into an introductory period that builds knowledge and understanding of genetics, music, and connections between the two; a project period in which interdisciplinary teams work on projects they develop; and a closing period where students share and evaluate what they have learned.

Required Text: None

Other Readings:

We will periodically assign readings selected from the *primary literature*, *review articles*, and articles appearing in the *popular press*. Significant **self-directed reading** will be required during this course. Websites and other materials will be provided as starting points. Students will read material that addresses their project, in addition to material assigned to the entire class. Periodic discussions during class time are intended as venues for students to share what they have learned with their peers.

Request for Permission to Enroll: *Due last day of classes, previous term*

Students must explain their interest in the course and describe their relevant background with the instructor. The instructor will evaluate the student's preparation and motivation for the course. Course admittance is based on factors including the student's performance in prior biology courses, the student's potential to collaborate with musicians, the mixture of skills and experiences in the class as a group, and balance of the course with musicians in MUSC 540/737.

Course Requirements

Biology students in BIOL 599, Chords and Codons, will write two research papers and complete one collaborative project. The collaborative project includes producing A) a project plan, B) maintaining a "lab" notebook, C) periodic verbal and written progress reports, D) presentation of project outcomes, E) delivering agreed-upon products, and F) a written report of the project.

Course Schedule (Subject to adjustment)

Initial Phase: Introductory Lectures and Discussions

CLS 202 Mon 1/10: Course overview, origins, and review of the biology of DNA. What a genome is made of.
CLS 202 Wed 1/12: Music #1: Music as Organized Sound
Mon 1/17: MLK Day of Service; No class.
CLS 202 Wed 1/19: Translating DNA to music and vice-versa; Review of genetic concepts.
CLS 202 Mon 1/24: Music #2: Sonification and Data-Driven Music
CLS 202 Wed 1/26: The mechanics of transmission genetics.
CLS 202 Mon 1/31: Music #3: Mutational Music Project Ideas
CLS 202 Wed 2/02: Meet the Composers!
CLS 202 Mon 2/07: Project Brainstorming; **First paper due: Mutations**.

Project Phase: Collaboration between Biologists and Musicians

Studio B Wed 2/09: Idea exploration -- Group consultations, per appointment schedule
Mon 2/14: Idea exploration -- teams on their own. **Keep experimenting!**
CLS 202 Wed 2/16: All-biologists meeting & project brainstorming.

From 2/21 through 4/18 collaborative teams will continue meeting with each other and the instructors to develop, execute, troubleshoot, and revise projects. The schedule necessarily becomes flexible to accommodate the discontiguous schedules of biologists and musicians. To maintain progress, teams should meet once or twice per week for a total of 2.5 hours or more. Along the way, certain benchmarks need to be met:

Mon 2/21: **Written project plan is due via email by 3:30 PM.**

The project plan will include items such as: (1) a *research/creative activity statement*, (2) a *list of project goals*, (3) a description of the *project's significance* (4) a description of the strategies and methods intended for implementation, (5) a *time frame for completion* of the project's components, and (6) a list *deliverable items* that will be submitted at the end of the term (including at least the following: one or more audio files, an abstract, a powerpoint presentation, and possibly other elements such as software). The team should prepare a *project plan document* (typed, double-spaced) that includes the sections listed above and e-mail it as an attachment to the instructors. The project plan document may be amended over the course of the term in consultation with the instructors. Further instructions for the plan will be provided.

CLS 202 Wed 3/02: Feet to the fire: All biologists meet and present their progress to class.
FRIDAY 3/04: **Second paper due by 6:00 PM: Biology of Music**
Wed 3/16: **Written progress reports are due.**
Wed 3/23: **Written progress reports are due.**
CLS 202 Mon 3/28: Feet to the fire: All-bio verbal/auditory status reports, common challenges/solutions
Wed 4/06: **Written progress reports are due.**
Wed 4/13: **Written progress reports are due.**

For each written progress report, teams must email the instructors a report of work accomplished in their project since the previous report, problems encountered, solutions discovered, current road blocks, plans for the upcoming period, and list of tasks yet to be accomplished. A blank form will be provided for written progress reports. Teams may schedule individual appointments to meet with the instructor and discuss their progress on the dates specified.

4/24 (Sunday): UofSC Computer Music Concert. Concert at 7:30 PM in School of Music Recital Hall. Attendance is optional, some of your musician collaborators will have pieces in it.

Studio B 4/20, 4/25: **Project presentations.**

Each team will present their project to the class, discussing what they were trying to accomplish, what challenges they encountered, how they surmounted challenges, and how successful they ultimately think they were in accomplishing their goals. Format of the presentations will vary to accommodate different projects.

5/04: **Written project reports, deliverables, and lab notebooks due at 3:00 PM via email, or in the case of physical objects (e.g., a CD) to my mailbox in CLS 401.**

PROJECT FINAL REPORT

The project report should describe the final project in all matters, including a discussion of the biological objectives, description of the student's creative/technical process over the semester, and an evaluative assessment of the effectiveness of the project. Approximately 20% of the report should be dedicated to personal assessment and reflection on the learning process. Additional guidelines and expectations for the report will be provided later. Each student must write his or her own final report.

"LAB" NOTEBOOK

In order to document the scientific, creative, and technical processes employed in the project, students must *keep a lab notebook* and record entries in it at **every work session**. Students will be provided with lab notebooks for this purpose. The lab notebook should be useful when preparing progress reports, and can be discussed at each project meeting. The lab notebook must be turned in to Prof. Dudycha with the final written project reports.

OTHER REQUIRED MEETINGS

Students must be prepared to meet with their collaborative team as needed. Biology students must be prepared to teach biological principles to music students, and must be prepared to learn musical principles from music students.

All student teams must participate in *at least* the following required meetings: (1) initial project plan development meetings; (2) periodic progress reports as described above; (2) two mid-term project meetings where biology students share their group's progress with each other; (3) final project meetings where students present finished work to the instructors and other students. When students would like additional consultations about work-in-progress (requires one-on-one assistance, reaches any type of impasse, etc.), they should request a meeting with the instructor(s) via e-mail.

Grading Weight Distribution

12.5%	First paper (summary paper on mutation or other genetic process) (individually written)
12.5%	Second paper (research paper on biology of music) (individually written)
	Collaborative project
5%	Written project plan (team)
5%	Project plan presentation (team)
10%	Written progress reports / meetings with Instructor(s) (team)
5%	"Feet to the Fire" mid-term progress presentation (team)
10%	Lab notebook (team)
20%	Project product and presentation (team)
20%	Project Report (Individually written)

To generate a final grade, letter grades for each component of the course will be transformed into a number according to the UofSC GPA calculation scale (i.e., A = 4.0, B+ = 3.5, etc.), a weighted average will be computed, and the result will be transformed back into letters, using standard rounding when necessary.

Course expectations:

A. This course builds on foundations in general biology and your prior knowledge of genetics.

B. Students will cooperate effectively with their teammates.

C. Students are expected to participate in all course activities. A routine failure to do so is likely to lead to a poor grade on work performed in addition to preventing class participation.

D. Examinations. There are no exams.

E. Class participation. You are expected to participate in class discussions, exercises, and activities. In particular, many discussions will be focused on project development.

F. Check BlackBoard frequently. I post important information and documents there. I also post announcements about opportunities that may be of interest to you.

G. Students are adults who are responsible for their own performance in the course, and accept the consequences of the decisions they make.

Academic Integrity

The university academic integrity policy is available online at: http://www.housing.sc.edu/academicintegrity/ It is expected that all students will follow these policies.

Learners with Special Needs

Students with a documented disability should register with UofSC's Student Disability Resource Center (SDRC). SDRC will provide an official letter that sets forth recommended accommodations. I will work with you and with SDRC to ensure that accommodations are made such that nobody's educational experience is diminished. Please be sure to discuss your accommodations with me during the first week of the term. For more information call (803) 777-6142 or visit https://www.sc.edu/about/offices_and_divisions/student_disability_resource_center/.

Attendance and Participation

This is NOT a traditional class with a traditional number of regular meetings. Rather, you are expected to attend a limited number of pre-scheduled meetings, team work-sessions, and presentations. You will get as much out of this class as you put into it, and success begins with attendance. We are here to help you at every step along the way. Please keep me informed of any potential conflict with class. In the case of emergency or illness, please e-mail me as soon as you can reasonably do so.