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BIOB 486.01: Genomics

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GENOMICS (BIOB 486-01, Fall 2021)

Location

- Class is to be primarily in person, except where noted in the syllabus and with flexibility dependent on current health considerations and for students that prefer remote instruction.
- For students participating remotely, efforts will be made to allow for synchronous online instruction when possible. It is the student's responsibility to request such accommodations.
- Classes reserved for paper discussion will be held remotely during the regularly scheduled class time, as specified on the Moodle schedule. Synchronous participation is required for these meetings.
- M/W/F 11:00-11:50
- Chemistry 102, remote access through a specified Zoom link.

Primary Instructor

- Dr. Jeffrey Good (he/him/his), jeffrey.good@umontana.edu
- Interdisciplinary Sciences Building 309
- Student hours: (remote - link available on moodle).
- 4:00 - 5:00 pm Monday (starting today, Aug 30)
- 1:00 - 2:00 pm Wednesday (starting Sept 2).
- Otherwise Zoom or in person meetings by prior arrangement & appointment

Materials

- Textbook: None!
- Class website on Moodle - <https://moodle.umt.edu>
- I will assign various readings from the primary literature (journal articles) and assorted books, available as PDFs through the Moodle site. There will also be weekly video supplements, including recorded Zoom lectures, and duplicate legacy lectures recorded from previous years when possible and relevant.

COVID-19 Health Guidelines

- Adopted from general UM policy (see www.umt.edu/umonline/keep_on_teaching/), all guidelines are subject to change.
- Following current UM guidelines, mask use is **required** within the classroom.
- Each student is provided with a cleaning kit. The expectation is that students will clean their personal workspace when they arrive for class, and before they leave the classroom.
- Classrooms may have one-way entrances/exits to minimize crowding.
- Students are discouraged from congregating outside the classroom before and after class.
- Specific seating arrangements will be used to ensure social distancing and support contact tracing efforts.
- Class attendance will be recorded to support contact tracing efforts.

- Drinking liquids and eating food is discouraged within the classroom (which requires mask removal).
- All classes will be recorded and posted on Moodle (as in previous years).
- Stay home if you feel sick and/or if exhibiting any COVID-19 symptoms.
- If the student is sick or displaying symptoms, please do not come to class and contact the Curry Health Center at **(406) 243-4330**.
- We are all in this together. Please let me know if you have any concerns related to these guidelines or any other aspect of how this course is delivered.
- As a member of this class, you are a scientist in training and more qualified to evaluate scientific data than much of the world population. If you are not yet vaccinated, please educate yourself on the benefits, remarkable safety, and efficacy of these amazing scientific breakthroughs (<https://www.cdc.gov/coronavirus>), and then please get vaccinated (<https://covid19.missoula.co/get-vaccinated/>).

Introduction

The field of genomics has transformed the study of biology and human health – including our current efforts to contain SARS-CoV2. Several exciting new technological advances have driven this genomics revolution, including the development of new methods of ultra high throughput DNA sequencing. This course will explore the foundations of this exciting field including the cutting-edge methods used to produce genomic data, the powerful computational techniques for their analyses, and the biological insights that can be gained from performing experiments on a genome-wide scale. As genomic data mean very little in isolation, particular emphasis will be placed on comparative genomic techniques, and in the application of evolutionary principles to genomic data.

Learning outcomes

Expected outcomes are:

1. Understand the basic structural features of genomes.
2. Learn and apply the principles of population genetics to understand genome evolution.
3. Develop a conceptual understanding of the basic methodological and computational methods used in genome biology.
4. Develop an understanding of how the principles of population genomics inform our understanding of human evolution, health, and disease.
5. Be able to understand and critically evaluate the primary scientific literature.

Lectures

- M/W/F 11:00-11:50 a.m., Chemistry 102, except when noted on Moodle.
- **All classes will be recorded and posted on Moodle.** Synchronous attendance at lectures, either virtual or in person, is encouraged whenever possible and contribute to the participation component of the grading. Videos will also be used during some lectures and examples presented in these videos will sometimes be used as a basis for exam questions.

Discussion groups

Discussion among students has traditionally been an important part of this course, and I will do my best continue to promote this dynamic despite restrictions of COVID-19. We will frequently have extended group discussions focused on the assigned readings and related homework

questions. Some participation points will come from group Zoom meetings focused on that week's primary literature paper and from synchronous participation with lectures. These will be arranged by Zoom meetings with breakout sessions during the regularly scheduled class times. During this time, different assigned teams of students will explain various parts of that week's reading to the rest of the class. The take home assignments will deal with both the lecture and primary literature material. This actually worked great as a remote activity last year and so we will keep it in this format, regardless of current COVID guidelines.

Tour of the Genomics Core

In addition regular in class instruction, attendance on one of the pre-scheduled tours of the UM Genomics Core facility will be required. Many of the technologies that we will discuss are in daily use in the UMGC, and this short 'field' trip will give you an opportunity to see what is going behind the scenes. We will have multiple opportunities near the end of the semester, with details to be determined.

Miscellaneous information

- **Accessibility Syllabus Statement:** The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.
- **Late work policy** - This class will cover a lot of ground, and will require you to keep up with the lecture material and assigned reading. If you have a problem understanding the material, or with turning an assignment in on time, I strongly encourage you to contact me as early as possible. Late work may be accepted for partial credit. In general, I will not accept *severely* late work, but I am sympathetic and reasonable if you deal with me in an upfront and honest manner. Please do not wait until the last minute to explain your situation.
- **Academic misconduct** will be reported and handled as described in the University of Montana Student Conduct Code. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with [the Student Conduct Code](#). The work you turn in should be your own. You are of course free to discuss any aspect of the course with your classmates or us, including questions on the take-home assignments. You may come to consensus conclusions on the questions as a group, but at the point when you begin formulating your answer on the computer, the work must become completely your own. If I see any evidence of a student copying the work of another I will ask the involved students about the incident; if no obvious explanation exists I will treat the matter extremely harshly. This may include receiving a failing grade for the entire course and filing a report with the Provost & Vice President for Academic Affairs. I don't expect this to be an issue with this course, but I do want you to know that I take plagiarism very seriously. If you are unsure about any of this, I urge you

to just ask me before turning something in. The plagiarism diagram on the course Moodle page might be helpful if you are unsure.

- **Dropping course or changing grading status:** Changing the grading status (to CR/NCR) is not automatically approved after the 30th day of instruction. Exceptions to these rules may be requested by petition, but the petition must be accompanied by documentation of extenuating circumstances. Requests to drop the course or change the grading status after these deadlines simply to benefit a student's grade point average will not be approved.
- **Student Behavior:** To maximize their likelihood of success, students should attend each lecture, and complete any assigned readings before class. When in class (or participating remotely) students are expected to behave in a manner that is respectful of others. **All disruptive electronic devices must be turned off during lecture and Discussion sessions.** If you prefer, you may use laptops or tablets to take notes during lecture – please be respectful of others when doing so.

Grading

Exams will be designed to encourage synthesis of subject matter and not to simply test your ability to recall details. Exams will be in person, during regularly scheduled classes. If the constraints of COVID require a remote format, all exams will then follow a short essay format completed as a take home assignment. Late exams will not be accepted, although allowances may be made in case of emergency or illness will be administered if requests are made **prior** to the due date. Please contact Dr. Good *at least one week before an exam* if you would like to request allowances or other arrangements.

Grades will be based how many of **560 points** you earn over the course of the semester.

- (1) **Three mid-term exams** (100 points each; 300 points total, 50%)
- (2) **Participation/attendance in lecture and discussion groups** (50 points total, 8%).
- (3) **Homework** (100 points total, 17%).
- (4) **Tour of Genomics core field trip** (25 points total, 4%)
- (5) **Comprehensive final take-home exam** (125 points, 20%). The Final Exam will be comprehensive and test lecture and discussion material covered throughout the semester.

Final grades will be based on your total points as a percentage of the 500 total points possible.

Pluses (+) and minuses (–) will be used (**A, A–, B+, B, B–, C+, C, C–, D+, D, and D–**) in the assignment of letter grades will be determined by the distribution of total scores, following these guidelines:

- $\geq 90\%$ of points (540): A- or better
- $\geq 80\%$ of points (480): B- or better
- $\geq 70\%$ of points (420): C- or better
- $\geq 60\%$ of points (360): D- or better

These cutoffs may be adjusted downward (in favor of the student) to better reflect natural breaks in the class distribution of scores.