

PROKARYOTIC MOLECULAR BIOLOGY - BIOL 485/585

Syllabus SPRING 2020

INSTRUCTORS

Drs. Eva Top and Thibault Stalder
Offices: Life Sciences 258, 455
E-mail: evatop@uidaho.edu; tstalder@uidaho.edu
Phone: 208-885-5015

CREDITS: 3

PREREQUISITES

BIOL 250 and BIOL 380.

The pre-requisites are important! It may be necessary to review information from prior science classes so that you can keep up.

LECTURE TIME AND PLACE

Tuesdays and Thursdays 9:30-10:45 in Life Science South 447C

OFFICE HOURS TIME AND PLACE

Professor Top's office hours will be on Thursdays from 1:30 to 2:30 pm in LSS 258, and Dr. Stalder's office hours will be on Wednesdays from 4:00 to 5:00 pm in LSS 455. If you are unavailable at either of these times, then an appointment can also be requested by email. When doing so please suggest three alternative times when you are available.

COURSE TEXTBOOK and OTHER MATERIALS

The textbook for this course is Molecular Genetics of Bacteria (4th edition) by Larry Snyder, Joseph E. Peters, Tina M. Henkin, and Wendy Champness (ASM Press).

We strongly recommend the book since lecture notes will be limited and will focus mostly on figures. Reading the assigned text before class will also help you with in-class quizzes and assignments.

Additional materials: scientific papers to read, links to videos to watch and other background material will be posted in BbLearn during the semester.

COURSE SYLLABUS

A pdf of this syllabus is available in BbLearn.

COURSE DESCRIPTION:

These are exciting times for microbiology as we continue to learn about their critical role in human, animal, plant and environmental health, and in biotechnological applications. The recent development of new molecular methods has allowed us to learn much more about the evolution, diversity, structure and functions of these fascinating organisms.

The purpose of this course is to provide a detailed overview of the field of prokaryotic molecular genetics, with an emphasis on the domain Bacteria. Being able to identify the underlying molecular

mechanisms of various bacterial traits will improve the students' insights into how exactly bacteria impact our daily lives and how we can control that impact. Specifically, we expect that students will:

- 1) commit to memory a core set of facts about prokaryotic molecular biology
- 2) be engaged in class discussions
- 3) be able to draw sequences and products of molecular reactions
- 4) be able to recognize molecular components and define their function
- 5) be able to design experiments to find answers to new problems
- 6) be able to use basic bioinformatic tools to address molecular biology questions

LEARNING OUTCOMES

In accordance with the University of Idaho Learning Outcomes, it is expected that by the end of this course students will be able to:

- **Learn and integrate** - Through independent learning and collaborative study, develop and use advanced knowledge in the molecular genetics of Bacteria, and learn to integrate new material with information from other disciplines.
- **Think and create** - Apply the concepts and approaches learned in this course to solve future academic and professional problems.
- **Communicate** - Effectively communicate bacterial genetics concepts and data.
- **Clarify purpose and perspective** - Understand the relationship between bacterial genetics and medical, industrial and environmental challenges.
- **Practice citizens** - Through group work and class discussions, apply principles of collaborative engagement, socially responsible behavior, and respect for diversity; learn to explain to a layperson some of the critical roles that bacteria have in our daily lives.

LEARNING ACTIVITIES / ASSIGNMENTS

Students will be engaged in diverse activities involving focus-based lessons (e.g. lectures, reading assignments), interactions (e.g. discussions, group work), productions (written and oral summaries), problem solving, critical thinking (journal club), reflection (student generated questions).

Quiz Questions and Group Work

Progression of learning in this class is assessed by quiz questions to answer individually or in group throughout the lectures. The system we will use is "iClickers", for which you can either use a remote if you already have one, or we can lend you one, or you can download the iClicker Reef app for your mobile device or laptop. Detailed iClicker instructions will be posted separately and are also available on <https://macmillan.force.com/iclicker/s/iclicker-reef-students>. More details will be provided in class.

Each lecture we will try to ask about 3-4 questions, sometimes less, sometimes more; each will be worth 1 point, and 1 additional point will be automatically earned for participation. The first weeks we will just practice – no points for correctness. The in-class quizzes will provide you a way to assess your understanding of the lecture material and assigned readings and media. In addition, the quizzes will help you become familiar with the kinds of questions that will be on exams.

At various times you will be asked to answer a question or complete a specific assignment in class in small groups of 2 or 3 students. You will report on your findings or product in class. Finally, there will be three exams and a cumulative OPTIONAL final exam. These will evaluate a student's understanding of all assigned reading and media, as well as information presented and discussed in lectures. Exams 1, 2 and 3 will be taken during the normally scheduled lecture time and place.

The OPTIONAL final exam will be on Wednesday, May 13 from 8 to 10 am!!!

Student Questions and Discussion

Students will be asked to submit at least one question on BbLearn at least 24h in advance before each lecture after having read the assigned reading. We will do a practice run in class the first week. Posts on BbLearn are expected to be of high quality. Contribution should be well prepared, substantive, and compelling. Back up your examples and opinions with convincing evidence or links to factual sources. Make your posts thoughtful and well-written.

EXPECTATIONS and POLICIES

You are expected to attend all lectures. There will be no opportunity to make up in-class quizzes and assignments, but quiz grades will be corrected for University approved excused absences at the end of the semester. Excused absences are those that result from situations beyond the control of the student. These include, but are not limited to personal illness, serious family member illness or death, and sanctioned University events (e.g. athletics). If you want to make up a missed exam, a University approved excuse will also be required.

If you have a legitimate conflict with the day and time of a regularly scheduled exam then you must let the instructor know in writing one week prior to the exam. Failure to do so will forfeit the opportunity for a make-up exam and result in a grade of zero. If you have an **excused absence** the instructor will consult with the student to reschedule an exam that must be taken within one week. The day and time of the rescheduled exam, as well as the format of the exam, will be at the discretion of the instructor.

If you have more than two **final exams** scheduled on the same day then you may be eligible to re-schedule one of these exams, but you must inform the instructor no later than April 30, so that alternative arrangements can be made.

We are only the coaches. You must exercise your brain every day. Verbal and visual processing of information are critical parts of long-term learning. Practice drawing out pathways and processes. Verbal communication also stimulates questions and gives insight into information deficiencies. Talk to us, your friends, your parents, the wall, and describe what you are learning to boost your skills.

Learn as much as you can now. Socrates said, "I cannot teach anybody anything, I can only make them think." Einstein said, "Imagination is more important than knowledge."

YOUR GRADE*:

Course Work	Points	Percent of Final Grade (% for grad students*)
Class Participation	100	10% (8.3%)
Quizzes and assignments	300	30% (33.3%)
Exam 1	100	10% (8.3%)
Exam 2	150	15% (12.5%)
Exam 3	150	15% (12.5%)
Final Exam (optional)	200	20% (16.7%)
TOTAL	1000	100%

* See below for Graduate students

Letter grades (subject to some curving at the end of the semester if necessary)

A : 90%-100% B: 80%-89% C: 70%-79% D: 60%-69%

Note:

The final exam is optional, meaning that if not taken, the final grade will be weighted on a total of 800 points (1000 for the graduate students, see below).

Grade Disputes:

If you think that an exam was incorrectly graded then the scoring can be rechecked. To initiate this process, you need to explain your concern in writing and send it to the instructor no more than two class periods after the exam scores have been posted. **After this time your grade will be considered final and not subject to reconsideration.**

General considerations:

Spelling, grammar, punctuation, logic and legible handwriting are critical elements of communication. You may lose points on exams for misspelling, poor grammar or syntax, flawed logic **or illegible handwriting.**

GRADUATE STUDENTS:

You will have one extra assignment (**200 additional points**, so 16.7% of the final grade).

“*Docendo discimus*” which is a Latin proverb meaning “By teaching we learn”. The goal is to teach a lecture (one session of 1 h15 minutes) related to your research interests and connected to the topic of the class using modern teaching techniques to engage students. Specifically, you will

1. Come up with a topic related to the class content.
2. Prepare a one-page syllabus describing the content of the lecture (ask us for specifics).
3. Give the lecture of 1h15min, including time for questions and answers.

You will be assessed on the significance of the proposed lecture and its relevance to the class topics, the syllabus, and mostly the quality of the lecture.

- We will schedule a meeting with each of you in the week of February 25 to discuss the topic of your lecture.
- Your syllabus to share with the entire class will be due one week before your lecture (see class schedule, exact time for each student TBD).

200 pt “Prepare and present a lecture”		Points
Topic		20
Syllabus (1 page max.)	learning objectives, course materials, assignment, expectation, assessment/grading.	50
Class	Content Structure Clarity of the lecture Clarity of material Student engagement/involvement	130

LECTURE SCHEDULE

The tentative schedule below is also posted as part of the syllabus in BbLearn. It is an approximation of the pace of reading, lecture handouts and assignments. It will almost certainly change, stay tuned in class and on BbLearn for updates! There will be additional material handed out during the semester that you will be responsible for knowing. Reading the assigned material in advance is highly recommended, as you will be expected to submit one question in BbL for the instructor 24 h before each lecture, and it will be easier to follow the lectures and answer the in-class quiz questions. Note that the slides will not always contain all information necessary to do well on exams.

UNIVERSITY OF IDAHO ACADEMIC HONESTY POLICY

Academic honesty is governed by Article II of the University of Idaho's [Student Code of Conduct](#). All students are expected to uphold the highest standards of academic honesty. Academic dishonesty includes but is not limited to cheating on examinations, plagiarism, falsification of academic or other records, and the acquisition or use of test materials without faculty authorization. Students are reminded that examinations are to reflect their own work and knowledge. Plagiarism is defined as copying someone else's work, 'lifting' many words verbatim from another person, an article, a website, a newspaper, a textbook, etc; i.e., don't cut and paste! Copying from friends, enemies, and the internet will not prepare you for future employment!

STUDENT CONDUCT IN THE CLASSROOM

In the classroom, respect for one another and for the instructor is essential for an effective learning environment. Any behavior that is disruptive to the class or deemed by the instructor to be disrespectful to fellow students or the instructor, will not be tolerated. You are expected to show respect to your classmates and instructor by listening when others are speaking, and not belittling the opinions of others, even when you disagree. Behavior intended to embarrass, or ridicule others will not be tolerated and will have serious consequences. Respect also means no side conversations with fellow students, no texting or inappropriate use of laptops or tablets (for example, use of social media, surfing the web, etc.) no ringing cell phones, no sleeping in class, and so on.

UNIVERSITY OF IDAHO CLASSROOM LEARNING CIVILITY

Should you feel that classroom interactions do not reflect an environment of civility and respect, you are encouraged to meet with the instructor during office hours to discuss your concern. Additional resources for expression of concern or requesting support include the Dean of Students Office (855-6757), the UI Counseling & Testing Center's Confidential Services (855-6716), or the UI Office of Civil Rights and Investigations (855-4285).

ACADEMIC SUPPORT, TUTORING & COLLEGE SUCCESS

Academic support and tutoring

If you find that you need further assistance with course material outside of the classroom and instructor office hours then you are encouraged to contact the [Academic Support Office](#) or the [Tutoring & College Success Office](#).

UNIVERSITY OF IDAHO CENTER FOR DISABILITY ACCESS AND RESOURCES REASONABLE ACCOMMODATIONS STATEMENT

Reasonable accommodations are available for students who have documented temporary or permanent disabilities. All accommodations must be approved through the [Center for Disability Access and Resources](#) located in the Bruce M. Pitman Center, Suite 127 in order to notify your instructor(s) as soon as possible regarding accommodation(s) needed for the course. The Center can be contacted by phone (885-6307) or email (cdar@uidaho.edu).

Getting help: pass to success

To be successful in this course you need to:

- **Prepare** by reading the assigned chapters, exercises, and other material before class.
- **Attend class.** While there, pay attention to what is being said, ask questions, and think about the material being presented. Use good note taking skills.
- **Study regularly.** Most individuals will require 1-2 hours of study time for each hour spent in class. When studying use the resources made available to you by the instructor, in the textbook, and on the Web or in the library.
- **Seek help.** If you are having trouble understanding some parts of the material then meet with the instructor during regularly scheduled office hours or, if necessary, make an appointment.

UNIVERSITY OF IDAHO FIREARM POLICY

The University of Idaho bans firearms from its property with only limited exceptions. One exception applies to persons who hold a valid Idaho enhanced concealed carry license, provided those firearms remain concealed at all times. If an enhanced concealed carry license holder's firearm is displayed, other than in necessary self-defense, it is a violation of University policy. Please contact local law enforcement (call 911) to report firearms on University property. For more information, see <https://www.uidaho.edu/infrastructure/pss/firearms-on-campus>. The university remains committed to maintaining a safe work, living and learning environment on campus and does not tolerate any threatening use of firearms or any other weapons. While authorized license holders may have familiarity and be at ease carrying a loaded firearm, the university asks that they be aware that many people are not familiar with handguns and are uncomfortable in their presence.

CLASS SCHEDULE

Date (2020)	Topic	ASSIGNMENTS	Lecturer
January 16 (Th)	Introduction of the class and intro to the microbial world	Textbook, Introduction	Top / Stalder
January 21 (T)	Bacterial chromosome: DNA structure	Book Ch. 1: p. 13-34	Top
January 23 (Th)	Bacterial chromosome: DNA replication		Top
January 28 (T)	Bacterial chromosome: the nucleoid and segregation	Book Ch. 1: p. 34-53	Stalder
January 30 (Th)	Bacterial cell division	Ch. 14: p. 606-621	Stalder
February 4 (T)	RNA and bacterial gene expression	Book Ch. 2: p. 67-84 and p. 117	Top
February 6 (Th)	Protein synthesis	Book Ch. 2: p. 85-101, p. 104, and p. 118-120	Top
February 11 (T)	Genetic analysis I	Book Ch. 3: p. 125-143	Top
February 13 (Th)	Genetic analysis II	Book Ch. 3: p. 144-152	Top / Stalder
February 18 (T)	EXAM I	/	
February 20 (Th)	Regulation I	Book Ch. 12: p. 471-515 (not 502-504 and 511-513)	Top
February 25 (T)	Regulation II	Book Ch. 13: p. 525-534 (not 532), p. 539-542, p. 552, p. 555-562, p. 575	Top
February 27 (Th)	Transformation and Transduction	Book Ch 6: all Book Ch 7: p. 265-267, 272-274, 279, phage lysis (289-291), generalized transduction (314-317); Book Ch. 8: 323-325, specialized transduction (340-342).	Top
March 3 (T)	Mobile genetic elements (a perspective on current antimicrobial resistance crisis)	Groups present a mobile genetic element (based on review papers)	Stalder
March 5 (Th)	Transposition, site specific recombination, and families of recombinase	Book Ch. 9: p. 361- 382 and p. 387-398	Stalder
March 10 (T)	Homologous recombination	Book Ch. 10: p. 403-429 and/or review paper	Stalder
March 12 (Th)	DNA repair and mutagenesis	Book Ch. 11: p. 433-458	Stalder
March 16-20	SPRING BREAK	/	
March 24 (T)	SOS Response	Book Ch. 11 p 458-461 - Research paper / Video JW	Stalder
March 26 (Th)	EXAM II	/	
March 31 (T)	Genomic analysis I (sequencing technology)	Book Ch. 2: p. 110-115 + Review paper	Stalder
April 2 (Th)	Genomic analysis II (comparative genomic)	Ch. 9: p. 382-387 + Papers	Stalder

April 7 (T)	Genetic engineering	Book Ch. 1: p. 53-58	Stalder
April 9 (Th)	CRISPRs	Book Ch 7: p. 311-314 + Articles	Stalder
April 14 (T)	Plasmid biology	Book Ch. 4: p. 183-216, papers to be assigned	Top
April 16 (Th)	Plasmid biology - continued / Conjugation	Book Ch. 5: p. 219-242, papers to be assigned	Top
April 21 (T)	Experimental evolution of bacteria	Blount et al. 2008 & 2012 OR other	Top
April 23 (Th)	Antibiotics and antibiotic resistance	Review Munita and Arias (2016) and TBD	Top
April 28 (T)	EXAM III	/	
April 30 (Th)	Catch-up or guest lecture	TBD	
May 5 (T)	Graduate student I	Lecture Graduate Student I	Students
May 7 (Th)	Q & A		Top / Stalder
FINAL EXAM: Wednesday, May 13 from 8 to 10 am			