MICROBIOLOGY 612
PROKARYOTIC MOLECULAR BIOLOGY
FALL 2023

M/W/F 11:00 - 11:50am, IN-PERSON
Nancy Nicholas Hall, room 1135

Instructor
Briana Burton, Associate Professor
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Teaching Assistant
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Course Help Hours
TBD
or by appointment (arranged via Canvas messages)

COURSE INFORMATION

Course Description from Guide

Molecular basis of bacterial physiology and genetics with emphasis on molecular mechanisms; topics include nucleic acid-protein interactions, transcription, translation, replication, recombination, regulation of gene expression.

- Credits: 3 credits
- Level: Advanced
- Breadth: Biological Science
- L&S credit type: Counts as LAS credit (L&S)
- Cross listed: MICROBIO 612, BIOCHEM 612, GENETICS 612
- Course attributes:
    - 50% Graduate Coursework Requirement

Diversity & Inclusion

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background - people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/

Culture: The assumption and expectation in this course is that all members will endeavor to make the atmosphere welcoming and conducive to learning.

Requisite(s)

BIOCHEM 501 or 507 AND MICROBIO 470 or GENETICS 466 or 468
or
graduate/professional standing
or
permission of instructor

Credits and Time Commitment

This 3-credit class meets for three 50-minute class periods each week and carries the expectation that students will work on course learning activities for about 3 hours out of the classroom for every one hour in class. See the end of this document for a Module Rhythm chart to guide your time management for this course.

Course Overview and Content

An advanced course in molecular biology of prokaryotes, Micro 612 builds on the knowledge gained in Biochem 501/507 and Microbio 470/Genetics 466/468. The content focuses on our present understanding of molecular mechanisms obtained from biochemical, structural, and genetic approaches as well as experimental methods that reveal this information. Both foundational studies in "model" systems and non-model examples will be discussed.

The course will emphasize problem solving, data analysis, and discussion of primary literature. Course modules will address core molecular biology concepts such as fidelity, specificity, plasticity, and spatial and temporal organization through topics including replication, topology, repair, gene expression, translation, regulatory networks, signaling, horizontal gene transfer, cellular defense systems, protein secretion, and bacteriophage.

Course content will be available on the Canvas site, https://canvas.wisc.edu/courses/364788. Login using UW NetID. Students are responsible for content of the course and are therefore expected to visit the course site regularly for important course information, including in-class and after-class assignments with due dates, course reading materials, course assessments, and answers to the problems.

Course Learning Outcomes

- to identify mechanisms that define molecular processes in bacteria
- deconstruct how these enzymes respond to nutritional and environmental signals in cells
- outline the evolutionary basis and selection pressure for these mechanisms in vivo
- evaluate the experiments that led to our understanding of these mechanisms
- compare the structural basis for these mechanisms
- access and evaluate original research literature
- demonstrate problem solving practices

Course format

The course meets in-person for a mix of lecture content, in-class problems solving, content discussion, and primary literature discussion. Students are expected to complete all Canvas assignments and readings with due dates on time and to contribute fully in-class. Students are encouraged to ask questions of the instructors, and to use class notes and additional resources as needed to fill in background or supplement class content.

Modules: The course is divided into **ten modules**, and each module has a small assessment at the end. (There are no large midterms during the semester). Each module in the course will use the following general rhythm: day 1 and 2 topic content and problem solving, day 3 literature discussion, day 4 summary, asynchronous assessment. Each module contributes equally towards the final grade except that a fixed number of low scores will be dropped automatically (see grading).

Time management: One of the keys to completing this course successfully is having a plan that will serve as a guide for your time management. Use the Module Rhythm chart to assist you with this. You should plan on spending an **average of 3 hours per credit hour** on the various course components outside of class per week.

Support: We want you to have a rich and successful experience. As such, we provide strategies and structure to help you succeed in this course. Ultimately however, as upper-level students, it is important that you take responsibility for your own learning. If there are items you need to review, consult Canvas for suggested resources.

Approach: Science is about problem solving and building new knowledge. This requires practice that goes beyond memorization of terms. When working groups in class, students should take this opportunity to discuss content. Time spent working problems together and discussion with the instructors is meant to help students identify key concepts in class material and to provide practice in applying concepts to problem solving. When entering answers into canvas activities, students should respond to the problems with an individual answer, completed using their own thinking and words, as this is useful practice for individual assessments. Some problems will specify submission of group answers rather than individual work.

Course Participation

Each class content day includes some form of activities. These must be completed to receive credit. In Canvas, these activities are designated by “IC” for in-class question. Class attendance will not be graded directly, however, problem solving questions and group discussion activities will be completed and due during class meeting times.

Problems

Each class content day includes after-class problems to work through. These problems can be discussed in groups but must be completed and submitted individually in Canvas to receive credit. These can be considered “problem set” points. These are not graded for correctness; they are intended to familiarize students with material and allow for practice handling the material. These can be repeated multiple times until the due date to improve answers and understanding. Correct answers are provided after the due date, and students are expected to use this information to check their understanding of the material. In Canvas, these activities are designated by “AC” for after class.

Literature and discussion

Each module includes a primary literature article for reading and discussion. Reading must be completed prior to class discussion, as your group work depends upon prior knowledge of the paper. Participation in literature discussion will be recorded in Canvas with activities designated by “LD”.

Summary questions and feedback

In each module there will be activities to deepen and clarify understanding of the material. These will be a mix of individual and group activities.

Module Assessments

Each module has an individual Assessment at the end. The best preparation for these is to practice answering problems, review class content and the article and be an active participant in all discussions. Assessments for each module are to be completed individually. Each Module Assessment will emphasize on the most recently covered material, but will assume prior module knowledge. Module Assessments are designated in Canvas by "MA".

Assessments will be available on the last day of each module and are to be completed asynchronously.

For reference the list of dates is here:

1. Friday, Sept 15-17
2. Monday, Sept 25-26
3. Wednesday, Oct 4-5
4. Friday, Oct 16-17
5. Monday, Oct 25-26
6. Wednesday, Nov 3-5
7. Friday, Nov 13-14
8. Monday, Nov 22-26
9. Friday, Dec 4-5
10. Monday, Dec 13

Please inform instructor by Sept 13th about any necessary accommodations or legitimate time conflicts so that arrangements can be made in advance.

Final Assessment

As per registrar scheduling, the course final is Saturday, December 16, 7:45am-9:45am. The option to complete the final assessment asynchronously will be discussed in class.

Please inform instructor ASAP about any necessary accommodations or legitimate time conflicts at least three weeks prior to the date of the final.

Grading

Final letter grades issued to transcripts will be calculated based on participation, problem solving, primary literature analysis, and assessments associated with course content. The components are weighted as follows:

Module 0 1%: These points are "guaranteed" as long as you complete the beginning of the year surveys for student information, background content assessment, integrity pledge, and short reading question.

In Class Activities 11%: These points come from completion of In-Class (IC) activities during class. It is expected that students will review content associated with incorrect answers to clarify those topics. Three of these will be dropped automatically.

After Class Problems 20%: These points come from working After-Class (AC) problems associated with class material. Collaborative discussion of the problems with peers and instructors is strongly encouraged; answers must be submitted individually. Final answers from each student must be in the student's own words so that students can practice summarizing and communicating their knowledge independently. Students have unlimited attempts prior to the due date to repeat and improve upon their answers. The lowest three of these AC scores will be dropped automatically.

Literature Discussion 6%: These points come from group discussion activities associated with each primary literature paper in the course. The lowest LD will be dropped automatically.

Summary Questions and Feedback 17%: These points are for activities that help summarize content from the modules and deepen understanding of the material. A mix of individual and group activities will typically be listed as SQ and SF and the lowest for each will be dropped automatically.

Module Assessments 30%: These points come from each of the ten Module Assessments which are completed individually. The two lowest MA scores for each student will be dropped automatically, so only the best eight will count towards the final grade. Each of the remaining eight module assessments contribute equally (3.75% each) towards the final grade.

Final Assessment 15%: These points come from the final assessment. Students will be responsible for all course material at the end of the semester. The final assessment will be individualized to focus on content that was most challenging to each student during the semester (i.e. if you already demonstrated proficiency with a topic, it is less important to demonstrate proficiency again).

Guaranteed minimums for grades are: >92% is A, >90% is AB, >82% is B, >80% is B/C, >72% is C, >62% is D.

If the class average of final grades is *below* 80%, final grades will be curved such that the class average will be at least 80% (B/C). Grades will never be curved down.

Life-outside-of class policy

During the semester many events outside the "classroom" can come up which affect a student's ability to attend a given class time or complete assignments by a deadline. Some of these are known in advance (conference attendance, religious observances, etc.) Some are unexpected (illnesses, family emergencies, missed alarm clocks). Every student has different needs during the semester, and due to the number of students in the course, arranging alternative deadlines around all these disruptions is not realistic. Instead, to maintain equity across students and the reasons that class days might be missed, the grading scheme is designed to account for these situations. For each student, course grades will **automatically drop three IC activities, the lowest three AC activities, the lowest LD, SQ, and SF assignments, and two lowest Module Assessment scores**; only the top eight out of nine possible Assessment scores will be used for each student. In total this means up to 10% of the course days can be missed/dropped without affecting a final grade. **Thus, each student's grade will reflect their best performance in the course.** The goal is for students to focus their energy on learning and not worry about evaluation.

Course Materials

All course materials (lectures, videos, practice problems, assignments, study guides, etc.) are protected by copyright and **may not be re-posted or re-distributed in any form**. Recording of in-class material is not allowed without a signed contract with the instructor. Contact the instructor if you wish to record in-class material.

Textbooks for supplemental background

The recommended textbook for supplemental reading is Molecular Genetics of Bacteria 4th edition (Snyder et al), which is available on reserve at Steenbock Library. Most of the material also can be found in the 3rd edition of this textbook, although some content may be out of date. Another useful textbook resource, also on reserve, is Molecular Biology of the Gene 7th edition (Watson et al).

COURSE POLICIES AND OTHER COURSE INFORMATION

Late work policy

(See Life-outside-of-class policy with grading) The course is structured with many intermediate deadlines to help students keep up with the material. Late submissions receive a zero automatically; the number of individual deadlines make it impossible to address each student's individual missed deadlines. Instead, the course has a policy for automatically dropping multiple low scores; see the note in the section on Grading. This allows students flexibility for missed work due to a variety of reasons without penalty, helps make participation based grading equitable, and allows a focus on content learning rather than points and grades.

A Note on Problem-Solving

Science is not about memorizing trivia: memorization of facts will only get you so far in this class (and in science in general). A good scientist not only knows the facts but can also use them to solve problems. Remember that scientists apply their knowledge and experience in solving problems to address new problems on a daily basis. Microbiology 612 is designed to encourage you to practice thinking like a scientist by applying your knowledge and understanding toward problem solving and evaluating primary research studies.

If you find yourself staring at problems with no idea of how to proceed, do not despair. Solving problems is a learned art. You must keep practicing and the process will become easier. Reading literature and seeing more examples of how others have approached research questions will strengthen your own toolkit in this space.

Remember that the assignments and practice problems are not an end in themselves, but a vehicle for mastering this material. Good problem-solving skills will be needed in this course, as well as for science generally, and this is the time to be gaining practice.

ACADEMIC POLICIES

Rules Rights & Responsibilities

- See: https://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilitiestext

Academic Calendar and Religious Observances

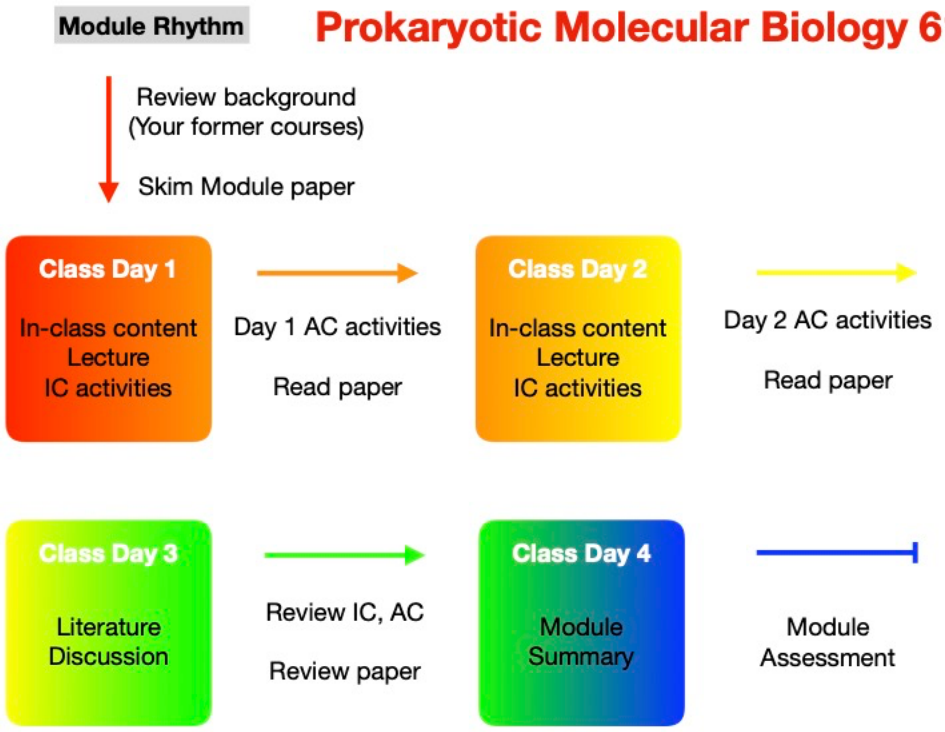
- See: https://secfac.wisc.edu/academic-calendar/#religious-observances

Academic Integrity

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to https://conduct.students.wisc.edu/academic-integrity/

Accommodations For Students With Disabilities

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform the instructor of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. The instructor will work either directly with the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA."
http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php



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