Microbiology/Genetics/Biochemistry 612 (Prokaryotic Molecular Biology)
MWF 11-11:50, Room 1420 Microbial Sciences Building
Lecture Schedule for Fall 2018

Course organizer: Rick Gourse (rgourse@bact.wisc.edu, 5470 MSB, 262-9813).

Other lecturers:
Bob Landick (landick@bact.wisc.edu, 5478 MSB, 265-8475)
Tim Donohue (tdonohue@bact.wisc.edu, 5166 Wisconsin Energy Institute, 262-4663)
Katrina Forest (forest@bact.wisc.edu, 6552 MSB, 265-3566)
Jason Peters (jason.peters@wisc.edu), 6115 Rennebohm Hall

Teaching Assistant:
Rachel Salemi (rsalemi@wisc.edu) 5465 MSB, 608-262-2419
Office Hours Wednesday 2-3 pm, 5415 MSB

Tentative Class Schedule

TRANSCRIPTION: STRUCTURE, CATALYSIS, PROMOTER RECOGNITION, REGULATION		
Wed 9/5	Promoter recognition I	Gourse
Fri 9/7	Promoter Recognition II	Gourse
Mon 9/10	*Discussion*	Salemi/Gourse
Wed 9/12	RNAP structure-function	Landick
Fri 9/14	Catalysis, promoter escape	Landick
Mon 9/17	*Discussion*	Salemi/Landick
Wed 9/19	Pausing, termination	Landick
Fri 9/21	Attenuation, anti-termination	Landick
Mon 9/24	*Discussion*	Salemi/Landick
Wed 9/26	Transcription Initiation: Negative Regulation	Gourse
Fri 9/28	Transcription Initiation: Positive Regulation	Gourse
Mon 10/1	Two-component systems	Donohue
Wed 10/3	mRNA decay and sRNAs	Gourse
Fri 10/5	*Discussion*	Salemi/Gourse
Mon 10/8	**Normal class time: review session** **EVENING: Exam 1 (10 lectures)**	Salemi/Gourse
RIBOSOME STRUCTURE AND THE MECHANISM OF TRANSLATION		
Wed 10/10	Translation I: rRNA maturation, ribosome assembly	Gourse
Fri 10/12	Translation II: ribosome structure, active site, decoding site	Gourse
Mon 10/15	Translation III: tRNA structure, genetic code	Gourse

Wed 10/17	*Discussion*	Salemi/Gourse
Fri 10/19	Translation IV: initiation	Gourse
Mon 10/22	Translation V: elongation, fidelity, peptide exit channel, ribosome-based antibiotics	Gourse
Wed 10/24	Translation VI: Termination, alternative readings of the code, introns, and inteins	Gourse
Fri 10/26	tmRNA, 6SRNA	Gourse
Mon 10/29	*Discussion*	Salemi/Gourse
Wed 10/31	Protein Folding and Protein Secretion I	Forest
Fri 11/2	Protein Secretion II	Forest
Mon 11/5	*Discussion*	Salemi/Forest
Wed 11/7	**Normal class time: review session** **EVENING: Exam 2 (9 lectures)**	Gourse/Salemi
	GLOBAL REGULATORY NETWORKS	Gourse
Fri 11/9	The Unfolded Protein Response	Gourse
Mon 11/12	Translational control and r-protein synthesis	Gourse
Wed 11/14	rRNA and Ribosome synthesis	Gourse
Fri 11/16	*Discussion*	Salemi/Gourse
Mon 11/19	Lambda I: Genetic networks/operator control	Gourse
Wed 11/21	Lambda II: Lambda induction and SOS	Gourse
Fri 11/23	No class (Thanksgiving Break)	
Mon 11/26	*Discussion*	Salemi/Gourse

Wed 11/29	CRISPR	Peters
	REPLICATION/RECOMBINATION/REPAIR/	
Fri 11/30	Replication I	Gourse
Mon 12/3	Replication II	Gourse
Wed 12/5	*Discussion*	Salemi/Gourse
Fri 12/7	Replication III	Gourse
Mon 12/10	Replication IV	Gourse
Wed 12/12	*Discussion*	Salemi/Gourse
TBD	Review session	Gourse/Salemi
Tues 12/18	**Exam 3 (10 lectures) 12:25 PM-2:25 PM**	Gourse/Salemi

Micro/Biochem/Gen 612 General Information, Fall 2018

INTRODUCTION:
This course is designed for graduate students and advanced undergraduates with some background in prokaryotic molecular biology. Several other courses are offered that overlap to some extent with some of the subject areas covered in Micro 612. Micro 470 and Micro 526 are courses designed for undergraduates. Graduate courses with some overlap with Micro 612 are Micro 668 (Microbiology at Atomic Resolution; Prof. Forest, Semester II); Biochem 620 (Eukaryotic Molecular Biology; Profs D. Wassarman and Ansari, Semester II).

ORGANIZATION AND RATIONALE OF THE LECTURES:
The course will survey topics in prokaryotic molecular biology including transcription, translation, regulation of gene expression, and DNA replication/repair. The object of the course will be to outline basic paradigms in molecular biology and approaches that are used to solve such problems. In general, the course emphasizes our present understanding of molecular mechanisms obtained from biochemical, structural, and genetic approaches as well as how the information was obtained. Reading of selected papers from the primary literature will be required. This is not a "methods" course: the details of specific methods will be described insofar as necessary to understand how particular information was obtained, but the emphasis will not be on details needed to perform such experiments for your own research projects.

PREREQUISITES:
There are two prerequisites: an undergraduate course in basic biochemistry (e.g. equivalent of Biochem 501 or 507-508) and some background in bacterial genetics/physiology (either a course similar to Micro 470 or some lab experience involving bacterial genetics). If you have not had an introductory biochemistry course or comparable experience, you definitely should not enroll in Micro 612. If you have not had any introduction to bacterial genetics, you may enroll in Micro 612 but you will probably have to do some background reading on some topics. Feel free to come speak with Dr. Gourse if you have questions about whether your background is sufficient.

OFFICE HOURS:
Your TA will be Rachel Salemi. She will hold office hours on Wednesdays from 2:00-3:00 PM or by appointment in MSB Room 5415 – this is the small conference room right next to the Gourse lab.

HANDOUTS:
Hard copies of the lecture outline, lists of related references for more information, study questions, and B&W versions of the figures used for the lectures will be provided at the lecture so that you can take notes on the hard copies. **GET A BINDER OF SOME SORT TO ORGANIZE THESE HANDOUTS. YOU WILL NEED THE HANDOUTS AND YOUR LECTURE NOTES TO REVIEW FOR THE EXAMS AND AS A RESOURCE TO ANSWER QUESTIONS DURING THE EXAMS.** In some cases, a single handout will be used for more than one lecture, so please bring the handouts to class.

Electronic copies of slides (in color) and lecture notes will be made available after each lecture on Learn@UW. Other course materials (syllabus, past exams, etc) will also be uploaded on Learn@UW. If for some reason you do not have access (e.g. you are not registered), let Dr. Gourse or the TA know, so they can give you access.

READING:
Getting practice in reading primary literature is an essential part of this class. Papers from the primary literature will be assigned for discussion. Since papers are available electronically, hard copies will not be handed out in class. If you are accessing journals from a campus IP address, you will be able to open articles via Pubmed links or from journal web sites. If you are off campus, you will need to go to the journal via the UW Library home page link to electronic journals. This requires authentication with your NetID. Being able to access original journal articles is an essential skill for this course and for learning/doing science in general!

The lectures contain a lot of information. You are not expected to absorb everything, but you are expected to know what subjects were covered and where to look for the information. Detailed lecture notes will be provided on the website for most lectures. Many students find these lecture notes essential in order to digest the information on the slides/handouts.

No single textbook is required to accompany the lectures. However, many students may find it necessary to read appropriate chapters in a textbook to accompany the lectures. Appropriate sections in textbooks will be listed in the handouts accompanying most lectures.

Texts in Steenbock Library (hard copies only):
L. Snyder et al; *Molecular Genetics of Bacteria*. ASM Press (Fourth edition or newer). This is the book used for Micro 470.
Nelson, and Cox M; *Lehninger's Principles of Biochemistry*. WH Freeman (Fifth edition or newer). This is the course used for Biochem 501 and 507-508.
MM Cox, J. Doudna, M. O'Donnell; *Molecular Biology* (second edition; Freeman)
M. Ptashne; *A Genetic Switch, Phage Lambda Revisited*. Cold Spring Harbor Lab Press (3rd edition). This short book is a great introduction to bacteriophage lambda.
Branden and Tooze (1999); *Introduction to Protein Structure*. Garland Science (2nd edition). This is an introduction to structural biology.

ORIGINAL PAPERS, PROBLEM SETS, DISCUSSION SESSIONS:
Reading assignments and/or problem sets will be distributed for most lectures. Some of the Discussion sessions will be organized around the problem sets, some around original literature, some both. The reading and problem sets will be of use to you in developing and testing your understanding of the material. Problem sets will not be collected or corrected, but to encourage full participation in the discussion of the primary literature papers, each student will be required to write up the answer to one assigned question from the study questions that accompany each paper; the answer should be uploaded to the Learn@UW drop box before 9:00 PM the day before the discussion section.

Working with fellow students on the reading and problem sets is encouraged and understanding of these will be essential preparation for the exams. Answers will be made available electronically. The discussion sessions will be organized by the instructor of that week's lectures and by the TA. This will be your opportunity to ask questions on the lectures and the problem sets.

You are asked to submit a question about the recent lectures every week – something you didn't understand or want more information about – submit by 9 pm on Friday night. We will survey these questions and address a few to start the lecture or provide written answers on-line.

GRADING:
Basically, if the material is in the lecture notes (even if it gets left out of the lecture itself), you're responsible for it. Your grade is determined by the two exams and the final exam, as well as by class participation. The exams will be in-class, but open book. The exams will not be cumulative: they will cover only the material since the previous exam. The exams will emphasize problem-solving skills and will not require memorization.

You may refer to notes or whatever materials you wish to bring with you to the exam. In order to perform well on these exams, you will need to have worked on the problem sets and to have read and thought about the papers assigned for class. The exams serve a key purpose: they provide students with a structured time to review the material covered in the lectures/discussion sessions. Studying for an exam is active learning: it provides a mechanism for bearing down and thinking about the information. We will provide the previous year's exam as a study aid. We strongly encourage you to take this in a realistic setting, timing yourself and really committing to an answer as opposed to flipping through the exam and the answer key and thinking you get it.

The first two exams will be held in the evenings from 5:30-7:30 PM on Mon Oct 8 and Wed Nov 7. If you cannot take an exam at that time, please see Dr. Gourse so that other arrangements can be made. The third exam will be during the final exam period, Wednesday Dec. 18, 12:25 AM – 2:25 PM.