Bio 404/504 (LEC)
Spring 2020
MWF 11am-12:10pm
Norton 213

Description: This course highlights the experimental basis for our understanding of the mechanisms of DNA replication and gene expression. Students learn to read and analyze the primary research articles that underpin molecular genetics. Topics include: DNA replication, chromatin and chromosome structure, the transcription process, regulation of transcription, RNA processing and decay, and translation. Specific topics are listed in the schedule below.

Course Info: This class meet on MWF from 11AM-12:10PM. The class will meet in Norton 213. This course incorporates active discussions between students and faculty. For all course-related administrative questions, please email the course coordinator Dr. Michael Yu at mcyu@buffalo.edu.

Instructors:

Dr. Michael Yu (Course Coordinator)
509 Cooke
645-4931
mcyu@buffalo.edu
office hours by appointment

Dr. Jim Berry
107 Dorsheimer Laboratory/Greenhouse
645-4997
camjob@buffalo.edu
office hours by appointment

Dr. Zhen Wang
653 Cooke
645-4969
zhenw@buffalo.edu
office hours by appointment

Dr. Sarah Walker
534 Cooke
645-2272
walker47@buffalo.edu
office hours by appointment

Attendance Students are responsible for all material presented during the lectures and discussions, regardless of whether they are present.

Participation During each class, students will be asked to participate through presentation of figures from primary literature. Each instructor may provide additional in-class assignments or quizzes, and you must be present to take these.

Calculators If needed, only numeric calculators will be allowed in exams.

Cell phones Cell phones cannot be out during exams. No exceptions.

Re-grading Exams Simple issues regarding scoring of exams, such as addition errors, will be handled on an individual basis. Questions regarding interpretations of answers must be submitted **in writing** within one week of the return of graded exams. **We will regrade the entire exam**, not just the question at issue.

Exams: There will be 4 exams, each of which will be 1/4 of the final grade. The last exam will not be cumulative. Make-up exams will be given only with a valid medical excuse and will be oral or written at the instructor's discretion. If you have a medical reason for missing an exam, the instructor must be notified within 24 hours of missing the exam. If notification is not given, you will receive a grade of zero for that exam. A schedule of lectures is enclosed. Exam dates will not change.

Readings will consist of scientific papers assigned by each instructor.

Grading Policy

A total of 400 points will be possible for the course, with each exam totaling 100 points. However, each instructor, at his or her discretion, may allocate a percentage of points from his/her exam question to be earned in the form of quizzes or other types of assignment. This will be specified by the instructor.

In general, grade assignments will follow the **Graduate Grading Policy** as defined by the Vice Provost for graduate Education. Plus and minus grades will be given. Scores of 90-100% are guaranteed to be in the A range, 80-89% in the B range, etc. However, if the mean score is less than 75%, the cutoffs for each grade will be lowered.

April 19 is the last day a student may resign from a course and receive an R grade.

Incomplete grades will only be given if a student is unable to complete the course due to severe unforeseen problems. **The student must be receiving a passing grade** in the class at the time the Incomplete is issued. The student will be given up to 12 months to complete **only that portion of the work that was not completed**. An "I" grade does not allow you to "start over" next year.

UB's policy on receiving an I grade: https://catalog.buffalo.edu/policies/explanation.html

Academic Integrity

Students are welcome to work together while studying for the exams or doing specific assignments given by an instructor. **However, academic dishonesty of any kind, including submitting work that is not your own and cheating on exams, will result in an F.**

UB's academic integrity policy: https://catalog.buffalo.edu/policies/integrity.html

Accessibility

We do our best to accommodate students who have a diagnosed disability that makes it difficult to carry out the course work as outlined. If you have a concern, please contact the Accessibility Resources Office. Please present the documentation from Accessibility Resources to one of the instructors within the first two weeks of the course so that we can make necessary arrangements.

Information on accessibility resources at UB:
http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html

BIO 404/504 COURSE OUTLINE Spring 2020

Lecture #	Date	Topic	Instructor
1	Jan. 27	Overview of Course/Prokaryotic Transcriptional Engineering	Yu/Wang
2	Jan 29	Regulation of Transcriptional Units in *E. coli*	Wang
3	Jan 31	A Bottom-up Approach to Gene Regulation	Wang
4	Feb. 3	Oscillatory Network of Transcriptional Regulators	Wang
5	Feb. 5	A Synthetic System for Programmed Pattern Formation	Wang
6	Feb. 7	Interfacing Natural and Engineered Gene Networks	Wang
7	Feb. 10	Invasion of Cancer Cells by Engineered Bacteria	Wang
8	Feb. 12	Riboregulators for Post-Transcriptional Control in *E. coli*	Wang
9	Feb. 14	Engineering Transcription for Improved Ethanol Tolerance	Wang
10	Feb. 17	**Exam I**	
11	Feb. 19	Introduction/overview, Transposable Elements	Berry
12	Feb. 21	Trasposons in bacteria, animals, plants	Berry
13	Feb. 24	Trasposons in bacteria, animals, plants	Berry
14	Feb. 26	Trasposons in bacteria, animals, plants	Berry
15	Feb. 28	Trasposons in bacteria, animals, plants	Berry
16	Mar. 2	Trasposons in bacteria, animals, plants	Berry
17	Mar. 4	Transcription by RNA Pol I & III	Yu
18	Mar. 6	Transcription by RNA Pol I & III	Yu
19	Mar. 9	Transcription by RNA Pol I & III	Yu
20	Mar. 11	Transcription by RNA Pol I & III	Yu
21	Mar. 13	**Exam II**	
22	Mar. 23	Translation Overview and Peptidyl Transfer	Walker
23	Mar. 25	Peptidyl Transfer	Walker
24	Mar. 27	Antibiotics	Walker
25	Mar. 30	Translational control	Walker
26	Apr. 1	Eukaryotic Translation Initiation	Walker

27	Apr. 3	Eukaryotic Translation Termination/Recycling	Walker
28	Apr. 6	Regulation of translation by mRNA granules	Walker
29	Apr. 8	Regulation of translation by mRNA granules	Walker
30	Apr. 10	Genome Editing – CRISPR/Cas9	Walker
31	Apr. 13	**Exam III**	
32	Apr. 15	CRISPER interference - CRISPRi	Wang
33	Apr. 17	Group Project Presentation: Renewable Lubricants	Wang
34	Apr. 20	RNA Processing - Splicing	Yu
35	Apr. 22	RNA Processing - Splicing	Yu
36	Apr. 24	Post-transcriptional Gene Regulation – mRNA Export	Yu
37	Apr. 27	Post-transcriptional Gene Regulation – Nuclear Surveillance	Yu
38	Apr. 29	Post-transcriptional Gene Regulation – Nuclear Surveillance	Yu
39	May 1	Gene Silencing by Small RNAs	Yu
40	May 4	Gene Silencing by Small RNAs	Yu
41	May 6	Gene Silencing by Small RNAs	Yu
42	May 8	**Exam IV**	

Department of Biological Sciences Learning Outcomes and Assessment Grid for BIO 404/504

0 - not covered

1 - moderately covered

2 - extensively covered

Number	Program Learning Outcome	Depth	Specific Outcome Objectives	Assessment Instrument	Defined Success Level
1	Students will develop a broad background in the biological sciences and achieve an understanding and appreciation of basic biological concepts and principles. They will become proficient in five broad areas of biology: evolutionary biology, cell biology, physiology, biochemistry, and genetics.	2	Students will become proficient with key areas of molecular genetics	Exams	At least 60% of class earns 50% of available points
2	Students will acquire laboratory and field skills necessary to answer biological questions and an ability to understand and employ scientific methodologies. They will be able to understand how to obtain, critically evaluate, and communicate experimental results	0			
3	Students will gain understanding of how to integrate knowledge across biological sub disciplines and to synthesize examples, facts, or hypotheses from more than one level of organization into a coherent whole. They will also obtain the ability to integrate the physical sciences (chemistry, physics, and mathematics) with biology.	2	Students will understand how the integration of molecular genetic analyses leads to a more complete understanding of complex biological processes.	Exams	At least 60% of class earns 50% of available points
4	Students will develop effective quantitative reasoning skills and be able to operate as a scientist to formulate and test appropriate biological hypotheses. They will be engaged both independently and collaboratively in the scientific process and learn to critically evaluate the veracity and value of published information.	2	Students will develop quantitative reasoning skills in evaluating and interpreting experimental outcomes and how these outcomes support appropriate biological hypotheses.	Exams	At least 60% of class earns 50% of available points
5	Students will be able to retrieve information from multiple	2	Students will practice communicating the concepts	Exams	At least 60% of the class

	sources, to analyze this information and communicate it precisely in both written and oral forms.		presented in this course in short answer and short essay exam questions and through oral presentation during classes		earns 50% of available points.
6	Students will develop an interest in lifelong learning and be able to evaluate and advance knowledge in biology. Students will be exposed to current problems in biology, as well as develop an appreciation for the nature of living organisms, the mechanisms of life function, the different levels of biological organization and the interactions among organisms and their environments.	2	Students will learn about molecular genetic technologies and their application on modern biological science questions.	Exams	At least 60% of the class earns 50% of available points.
7	Students will learn to appropriately place biological knowledge into an ethical context, appreciate the importance of ethical conduct in science and demonstrate knowledge of contemporary social and ethical issues related to biology and the professional responsibilities of a biologist.	0			
8	Students will complete a more advanced level of study in areas of their choice to obtain a deeper coverage of at least one of the five broad areas.	2	Students will become proficient with key areas of molecular genetics	Exams	At least 60% of the class earns 50% of available points.