Term Information

Effective Term	Autumn 2018
Previous Value	*Summer 2012*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Change credit hours from 4 to 3.

What is the rationale for the proposed change(s)?

This course is cross-listed in Molecular Genetics and is being updated to match the MOLGEN course. This course primarily serves graduate students in the Molecular Genetics and MCDB PhD graduate programs as a first year course. It also serves as a potential senior elective for undergraduates in the Molecular Genetics major. The Graduate program in Molecular Genetics seeks to

streamline their lecture based course offerings to allow first year graduate students to focus a little more on their lab-based responsibilities. After reducing coverage of some prokaryotic-specific topics they found that the course is suitable to be offered in 3 credit hours. A three credit hour course will additionally be easier to schedule in the approved class grid, increasing accessibility for both graduate and undergraduate students.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

We anticipate no major programmatic changes. Students in graduate programs can maintain fulltime status by registering for an additional credit of lab research, reflecting their increased commitment in that area. The Molecular Genetics Department's examination of recent graduates from the undergraduate Molecular Genetics major indicates that the student population that takes BIOCHEM/MOLGEN 5701 will not be negatively impacted if the course is a 3 credit hour elective instead of a 4 credit hour elective.

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Biochemistry
Fiscal Unit/Academic Org	Biochemistry - D0310
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5701
Course Title	DNA Transactions and Gene Regulation
Transcript Abbreviation	DNA & Gene Regul
Course Description	Understanding mechanisms of DNA replication, DNA repair and recombination, transcription, translation, regulation of gene expression, and the experimental approaches to these topics.
Semester Credit Hours/Units	Fixed: 3
Previous Value	*Fixed: 4*

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade

Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: 4511 (511) or equiv, and MolGen 4500 (500) or 5606 (606); and Sr or Grad standing, or permission of instructor.
Exclusions	Not open to students with credit for 702 or MolGen 5701 (701).
Electronically Enforced	No

Cross-Listings

Cross-Listings	Cross-listed in MolGen.

Subject/CIP Code

Subject/CIP Code	26.0202
Subsidy Level	Doctoral Course
Intended Rank	Senior, Masters, Doctoral

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors
The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students describe and apply fundamental concepts applicable to DNA regulation

  Students will learn how DNA is replicated and repaired and be expected to understand the proteins involved in regulating these processes.
- Students explain how chromatin structure is critical to regulating activity on DNA.

  Students appreciate how a cell dynamically manipulates that structure to alter protein complex accessibility to the DNA and regulate genetic processes.
- Students understand regulation of RNA expression, including how cells control a gene’s output, the molecular machinery used to transcribe RNA, as well as transcriptional initiation, elongation and termination.
- Students learn different mechanisms cells use to alter activity of a gene after transcription and discuss post-transcriptional control mechanisms including RNA processing and micro RNAs.

Previous Value

Content Topic List

- DNA replication in E. coli and eukaryotes
- DNA polymerases and related enzymes
- Translesion polymerases
- DNA repair mechanisms
- Eubacterial RNA polymerase structure and function
- Sigma factors
- Regulation of transcription in eubacteria: the Lac operon, carbon-catabolite regulation, the Arabinose operon, bacteriophage lambda, attenuation, and riboswitches
- Eukaryotic RNA polymerase, promoter structure and regulatory elements, and general transcription factors
- Transcription initiation and elongation
- Chromatin remodeling
- Post-transcriptional regulation, including RNA modifications and alternative splicing
- Translational regulatory mechanisms
- Post-translational regulatory mechanisms, including targeted degradation
- Epigenetic regulation

Sought Concurrence No

Attachments

- AU 17 Bisaro BIOCHEM 5701.pdf

(Syllabus. Owner: Bowman,Michael Robert)

Comments

- 11/28/17: Please re-send. I am unable to open the pdf. *(by Haddad,Deborah Moore on 11/28/2017 04:59 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Bowman,Michael Robert	11/28/2017 04:03 PM	Submitted for Approval
Approved	Gustafson,Terry Lee	11/28/2017 04:08 PM	Unit Approval
Revision Requested	Haddad,Deborah Moore	11/28/2017 04:59 PM	College Approval
Submitted	Bowman,Michael Robert	11/28/2017 05:04 PM	Submitted for Approval
Approved	Gustafson,Terry Lee	11/28/2017 05:15 PM	Unit Approval
Approved	Haddad,Deborah Moore	11/28/2017 05:18 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	11/28/2017 05:18 PM	ASCCAO Approval

MOLGEN 5701
DNA Transactions and Gene Regulation

Monday, Tuesday, Wednesday, and Friday: 1:50-2:45
Format: Lecture
Jennings Hall, Room 040

COURSE DIRECTORS:

David M. Bisaro, Professor
Department of Molecular Genetics
201 Rightmire Hall
Phone: 292-3281
Email: bisaro.1@osu.edu

Craig J. Burd, Assistant Professor
Department of Molecular Genetics
Biomedical Research Tower, Rm 590
Phone: 688-7458
Email: burd.7@osu.edu

OFFICE HOURS:

Available by appointment. To set up a meeting, please email your instructor(s) using your name.# account.

COURSE MATERIALS:

- No textbook is required. Links to open source reading and A/V materials will be provided by the course directors on Carmen.
- Additional supplemental material will be available on closed (2hr) reserve in Biological Sciences/Pharmacy Library.

COURSE DESCRIPTION:

During this course, students will learn in detail the fundamental basis and molecular mechanisms that control DNA replication, DNA repair, RNA transcription, and post-transcriptional gene regulation. These processes are controlled through the actions of DNA binding proteins, chromatin architecture, epigenetics, and non-coding RNA molecules. Students will be expected to learn the details of these processes as well as the experimental methodology used to test these principles in the laboratory. Students will have to read and analyze research publications focusing on these molecular processes.

LEARNING OBJECTIVES:

1. **Describe and apply fundamental concepts applicable to DNA regulation**
   Students will learn how DNA is replicated and repaired and be expected to understand the proteins involved in regulating these processes

2. **Explain how chromatin structure is critical to regulating activity on DNA**
   The structure of chromatin and how that structure is epigenetically maintained will be described in detail. Students will learn how a cell dynamically manipulates that structure to alter protein complex accessibility to the DNA and regulate genetic processes.

3. **Understand how genes are regulated to produce RNA transcripts**
   Students will learn how the cells control the relative abundance of a gene's output and the molecular machinery used to transcribe RNA. The processes of transcriptional initiation, elongation and termination will be discussed in great detail.

4. **Learn different mechanisms cells use to alter activity of a gene after transcription**
   Post-transcriptional control mechanisms including RNA processing and micro RNAs will be discussed.

TENTATIVE COURSE SCHEDULE:

Lecture	Date	Topic	Lecturer
1	8/22	DNA Replication- General Concepts	Bisaro
2	8/23	E. coli DNA polymerase I and associated activities	Bisaro
3	8/25	Pol I and other Pol I-like enzymes	Bisaro
4	8/28	Research paper discussion	Bisaro
5	8/29	E. coli DNA polymerase III- clamps and clamp loaders	Bisaro
6	8/30	Pol III and the E. coli replisome	Bisaro
7	9/1	Replication fork activities/Okazaki fragment maturation in E. coli	Bisaro
8	9/5	Research paper discussion	Bisaro
9	9/6	Eukaryotic DNA polymerases	Bisaro
10	9/8	Eukaryotic replisome	Bisaro
11	9/11	Okazaki fragment maturation in eukaryotes	Bisaro
12	9/12	Research paper discussion	Bisaro
13	9/13	DNA damage tolerance & Translesion polymerases	Bisaro
14	9/15	Regulation of polymerase activities at the replication fork	Bisaro
15	9/18	Research paper discussion	Bisaro
16	9/19	Reverse transcriptase and Telomerase	Bisaro
17	9/20	Histones and chromatin structure	Bisaro
18	9/22	Higher order chromatin structure	Bisaro
19	9/25	Histone code/regulation of chromatin structure & accessibility	Bisaro
20	9/26	Research paper discussion	Bisaro
21	9/27	DNA methylation and epigenetic inheritance	Bisaro
22	9/29	Overview of DNA repair- Base excision repair (BER)	Bisaro
23	10/2	Nucleotide excision repair (NER)	Bisaro
24	10/3	Mismatch repair (MMR) and double strand break repair	Bisaro
25	10/4	Research paper discussion	Bisaro
26	10/6	The gene and prokaryotic transcription	Burd
27	10/9	RNA Polymerase I and III	Burd
28	10/10	RNA Pol II transcription	Burd
29	10/11	Research Publication Discussion	Burd
30	10/16	TATA-less transcription and Mediator Complex	Burd
31	10/17	Transcription Factors	Burd
32	10/18	Transcription Factors II	Burd
33	10/20	Research Publication Discussion	Burd
34	10/23	Enhancer Elements	Burd
35	10/24	Repressive Elements	Burd
36	10/25	Research Publication Discussion	Burd
37	10/27	Mediator Complex and DNA looping	Burd
38	10/30	Research Publication Discussion	Burd
39	10/31	Chromatin, Epigenetics and DNA accessibility	Burd
40	11/1	Co-regulator molecules – guardians of accessibility	Burd

41	11/3	Research Publication Discussion	Burd
42	11/6	Pioneering factors and master regulators	Burd
43	11/7	Research Publication Discussion	Burd
44	11/8	Insulators and gene organization	Burd
45	11/13	Transcriptional Repression	Burd
46	11/14	Research Publication Discussion	Burd
47	11/15	mRNA production: Elongation and termination	Burd
48	11/17	Splicing	Burd
49	11/20	Splicing II	Burd
50	11/21	Post-transcriptional regulation of RNA	Burd
51	11/27	Research Publication Discussion	Burd
52	11/28	Non-coding RNAs: miRNA	Burd
53	11/29	Other non-coding RNAs	Burd
54	12/1	Research Publication Discussion	Burd
55	12/4	Editing the Genome: From Zinc fingers to Crispr/Cas	Burd
56	12/5	Research Publication Discussion	Burd
57	12/6	Semester Review	Burd

GRADING POLICY:

The course is graded on an A-E basis. The grade will be based upon a student's performance on one midterm (50%) and a final (50%) exam. The mid-term examination will be held outside of regular class time and is tentatively scheduled for Monday October 9, 2017 at a time and location to be arranged. Prior to the midterm, a review session will be held outside of regular class hours at a time and location to be arranged. The mid-term exam will cover material from Dr. Bisaro's section of the course (lectures 1-25). The final exam will cover material from Dr. Burd's section of the course (lectures 26-57). The final exam will be held on Wednesday December 13, 2017 from 2:00 – 3:35 pm, according to the university schedule. Students are expected to take exams at the scheduled time. Make up examinations are only given in cases of documented emergency or illness.

GRADING SCALE:

A	93-100%	C+	77-79.9%
A-	90-92.9%	C	73-76.9%
B+	87-89.9%	C-	70-72.9%
B	83-86.9%	D	65-69.9%
B-	80-82.9%	E	<65%

Final grades will be based on your final percentage [(points accumulated/ total points for the course) x 100)]. Generally, the final grades assigned will reflect the OSU Standard grade scheme (above), however, the instructors reserve the right to adjust the lower limits for each grade category downwards if justified by overall class performance (i.e., a 90 % is guaranteed to receive an A-, but in some cases an A- may be assigned for a performance below 90%).

COURSE ATTENDANCE POLICY:

In order to be successful in this course, attendance is expected for all lectures and mandatory for all in-class exams and projects.

STATEMENT ON ACADEMIC MISCONDUCT:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

STATEMENT ON DISABILITY SERVICES:

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; http://slds.osu.edu.