#### Biochemistry 8007/8008 Syllabus

#### BioC 8007 Molecular Biology of the Genome

#### BioC 8008 Molecular Biology of the Transcriptome

**Fall Semester 2017**

**Time:** Sept 6th – December 13th, Monday and Wednesday, 8:00-9:55 AM

**Location:** Room 131A Bruininks Hall

**Bioc8007 and 8008 are each 2 credit, half semester courses**

**Intended Audience:** Graduate students in biosciences.

**Learning Objectives:**

The course will enable students to explore the molecular biology of the eukaryotic genome and transcriptome, focusing on biological processes and relationships to disease states. Students will gain a firm understanding of the fundamental concepts and techniques through lectures, reading, and discussions. In addition, students will learn to read and critically analyze scientific papers through student-led presentations and discussions.

Participants will gain experience in articulating scientific questions, formulating testable hypotheses, and designing experiments to test a hypothesis.

**Course format:**

Learning activities include instructor led lectures, student led presentations, and group discussions. The goal is to promote critical analysis of science through active learning.

Lectures: Instructors will introduce a topic through slide presentations, discussions, and assigned reading material, typically a recent review article.

Student-led presentations: At each meeting, a group of students will present the findings from a primary research paper to the class. Students will be assigned to groups by the instructors. Research papers will be chosen by the instructors.

Attendance is mandatory. In class participation in discussions will be encouraged throughout lectures and presentations.

After each class, students will submit short learning summaries to the instructor. The summary is paragraph describing the major concepts of that days lecture and presentation. Learning summaries are due by midnight on the day of the lecture.

**Course Directors/Instructors:**

Aaron Goldstrohm, Ph.D. Jeongsik Yong, Ph.D.

 Director of BioC8007 Director of BioC8008

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Office hours: please email to schedule Office hours: please email to schedule

**Teaching Assistant:**

Elizabeth Fay

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**Course website:**

myu.umn.edu – login and follow link to my courses and to BioC8007/8008 “Canvas Site Link”; current syllabus, powerpoint presentations, research articles, review articles, and grade-related materials will be posted.

**Course materials:**

All course materials will be provided on the Canvas website including assigned review articles and primary research articles, and slides.

**Evaluation/Assessments:**

BioC8007 and 8008 are each 2 credit, half semester courses and will be graded separately using the criterial listed below. Letter grades will be assigned on a scale of A-F.

* In class presentations: 50% of final grade.
* Take home examinations: 40% of final grade
* Participation/attendance: 5% of final grade
* Learning summaries: 5% of final grade

***In class presentations and participation in discussions are group-based efforts.***

***However, take home examinations and learning summaries are to be completed by the individually, NOT as a group.***

**Other Important Information:**

*Electronic Devices:*Computers are encouraged during classes but phone use will not be tolerated. During quizzes and exams, no electronic devices of any kind, including computers, calculators, iPods, etc.. Use of a prohibited device during an exam is considered Scholastic Dishonesty and falls under the University Student Conduct Code (for more information, please visit the Office for Student Conduct and Academic Integrity: [www.umn.edu/oscai](http://www.umn.edu/oscai)).

*Academic Misconduct:*Violations of acceptable academic conduct will elicit penalties such as a failing grade for the examination or a failing grade for the entire course, depending upon the nature and severity of the infraction. Although collaboration during quizes and examinations is strictly forbidden, students may work together on problem sets if the instructor gives explicit permission.

*Academic Integrity:*The grade in a course is intended to be a reflection of what you have learned in the course.  Any instances of plagiarism (presenting someone else's work as your own) will be dealt with through university procedures for academic dishonesty (for more information, please visit the Office for Student Conduct and Academic Integrity: [www.umn.edu/oscai](http://www.umn.edu/oscai)). If you need assistance in distinguishing between plagiarism and legitimate use and citation of someone else's work, please talk to the course instructor and consult the following resources: <http://tutorial.lib.umn.edu/> and [www.writing.umn.edu](http://www.writing.umn.edu/).

#### Biochemistry 8007 – Molecular Biology of the Genome

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| **Date** | **Day/****Time** | **Instructor** | **Topic** |
| 9-6 | W-1  | **Goldstrohm** | **DNA, Genes, and Genomes****How to read and present a scientific paper** |
|  |  | **Yong** | **Molecular and computational tools for studying genes** |
|  |  |  |  |
| 9-11 | M-1 | **Yong** | **Molecular and computational tools for studying genes**  |
|  | M-2 | **Goldstrohm** | **DNA replication** |
|  |  |  |  |
| 9-13 | W-1 | **Group** | **DNA replication** |
|  | W-2 | **Goldstrohm** | **DNA recombination** |
|  |  |  |  |
| 9-18 | M-1 | **Group** | **DNA replication** |
|  | M-2 | **Yong** | **DNA damage and repair** |
|  |  |  |  |
| 9-20 | W-1 | **Group** | **DNA damage and repair** |
|  | W-2 | **Goldstrohm** | **Chromatin and chromosomes** |
|  |  |  |  |
| 9-25 | M-1 | **Group** | **Chromatin and chromosomes** |
|  | M-2 | **Goldstrohm** | **Epigenetics** |
|  |  |  |  |
| 9-27 | W-1 | **Group** | **Epigenetics** |
|  | W-2 | **Goldstrohm** | **Transcription Initiation and regulation** |
|  |  |  |  |
| 10-2 | M-1 | **Group** | **Transcription Initiation and regulation** |
|  | M-2 | **Goldstrohm** | **Transcription elongation and termination** |
|  |  |  |  |
| 10-4 | W-1 | **Group** | **Transcription elongation and termination** |
|  | W-2 | **Goldstrohm** | **Transcription regulation** |
|  |  |  |  |
| 10-9 | M-1 | **Group** | **Transcription regulation** |
|  | M-2 | **Goldstrohm** | **Nuclear architecture** |
|  |  |  |  |
| 10-11 | W-1 | **Group** | **Nuclear architecture** |
|  | W-2 | **Goldstrohm** | **Translation** |
|  |  |  |  |
| 10-16 | M-1 | **Group** | **Translation** |
|  | M-2 | **Goldstrohm** | **Translation regulation** |
|  |  |  |  |
| 10-18 | W-1 | **Group** | **Translation regulation** |
|  | W-2 | **Goldstrohm** | **Genetic mechanisms of disease** |
|  |  |  |  |
| 10-23 | M-1 | **Group** | **Genetic mechanisms of disease** |
|  | M-2 | **Goldstrohm** | **Applications of DNA biology** |

**Biochemistry 8008 – Molecular Biology of the Transcriptome**

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| **DATE** | **Day/****Time** | **Instructor** | **Topic** |
| 10-25 | W-1  | **Yong** | **Understanding RNA biology I (50 min)** |
|  | W-2 | **Yong** | **Understanding RNA biology II (45 min)** |
|  |  |  |  |
| 10-30 | M-1 | **Yong** | **Understanding RNA biology III** |
|  | M-2 | **Yong** | **Co-transcriptional pre-mRNA Processing: capping and splicing** |
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| 11-1 | W-1 | **Group** | **Co-transcriptional pre-mRNA Processing: capping and splicing** |
|  | W-2 | **Yong** | **Co-transcriptional pre-mRNA Processing: alternative splicing** |
|  |  |  |  |
| 11-6 | M-1 | **Group** | **Co-transcriptional pre-mRNA Processing: alternative splicing** |
|  | M-2 | **Yong** | **Co-transcriptional pre-mRNA Processing: 3’-end processing** |
|  |  |  |  |
| 11-8 | W-1 | **Group** | **Co-transcriptional pre-mRNA Processing: 3’-end processing** |
|  | W-2 | **Yong** | **Pre-mRNA processing: dynamics of RBPs** |
|  |  |  |  |
| 11-13 | M-1 | **Group** | **Pre-mRNA processing: dynamics of RBPs** |
|  | M-2 | **Yong** | **mRNA export and localization** |
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| 11-15 | W-1 | **Group** | **mRNA export and localization** |
|  | W-2 | **Yong** | **long non-coding RNAs** |
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| 11-20 | M-1 | **Group** | **long non-coding RNAs** |
|  | M-2 | **Yong** | **Other classes of non-coding RNAs** |
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| 11-22 | W |  | **Break for Thanksgiving travel - Have a safe trip!** |
|  |  |  |  |
| 11-27 | M-1 | **Group** | **Other classes of non-coding RNAs** |
|  | M-2 | **Goldstrohm** | **RNA interference and miRNA** |
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| 11-29 | W-1 | **Group** | **RNA interference and miRNA** |
|  | W-2 | **Goldstrohm** | **mRNA decay** |
|  |  |  |  |
| 12-4 | M-1 | **Group** | **mRNA decay** |
|  | M-2 | **Yong** | **RNA modification** |
|  |  |  |  |
| 12-6 | W-1 | **Group** | **RNA modification** |
|  | W-2 | **Yong** | **RNA metabolism in disease pathogenesis** |
|  |  |  |  |
| 12-11 | M-1 | **Group** | **RNA metabolism in disease pathogenesis** |
|  | M-2 | **Yong** | **Proteogenomics – A view from RNA biology** |
|  |  |  |  |
| 12-13 | W-1 | **Group** | **Proteogenomics – A view from RNA biology** |
|  | W-2 | **Yong** | **Application of RNA biology** |