



**Course Identification Number and title:** BIOC532, Chromatin modifications and their biological importance

**Term and Year:** 2020 – Spring

**Number of Credits:** 2

**Time:** Tuesday: 5:30-7:30 pm

**Place:** Building 5, Conference Room 127

**Instructor and contact Information:**

Instructors	Telephone number	Email address	Classroom	Class hours
Dr. Kevin M. Brick		kevbrick@gmail.com	RM 217, Building 5	5:30-7:30PM Tuesday
Dr. Daman Kumari		damank2010@gmail.com	RM 217, Building 5	5:30-7:30PM Tuesday
Dr. Tiaojiang Xiao	919-636-8629	Txiao2015@gmail.com	RM 217, Building 5	5:30-7:30PM Tuesday
Dr. Florencia Pratto		fpratto@hotmail.com	RM 217, Building 5	5:30 - 7:30 PM Tuesday
Dr. Ghirlando Rodolfo		rodolfog@intra.niddk.nih.gov	RM 217, Building 5	5:30-7:30PM Tuesday

**Course Information:**

**Prerequisites, if any:** Students should have a general understanding of the basic concepts in genetics and biochemistry.

**Course Description:** Chromatin modifications play important roles in many cellular processes including the regulation of gene expression, DNA repair, and heterochromatin formation. The Bioc532 course will explore the various biological roles chromatin modifications play in eukaryotic cells. Topics that will be discussed in this course include: histone and DNA modifications and the enzymes responsible for these modifications; mechanisms of chromatin remodeling and transcription regulation; the role of non-coding RNAs in chromatin structure and gene regulation; higher-order chromatin organization and the use of various chromosome capture conformation methods (3C, 4C, HiC); chromatin structure and DNA damage repair. In addition, this course will introduce students to the genome-wide analysis of ChIP-seq, RNA-seq and HiC data using a variety of computer software, including the public accessible web servers., such as Galaxy and UCSC genome browser.

**Learning Materials:**

No textbook is required for taking this course. Each instructor will assign reading materials to students. These articles can be found in Pubmed.

**Course Goals**

After taking this course, students are expected to understand the basic concepts behind epigenetics, understand why epigenetics is important to human health, and to explain how epigenetic mechanisms work. In addition, students will learn how to perform basic analysis of epigenetics data, including the next generation DNA sequencing data.

**Important Dates:**

Drop deadline: 02/15/2020

Audit and withdrawal deadline: 02/15/2020

**Policies:**

**Academic Policies**

This course adheres to all FAES policies described in the academic catalog and student handbook, including the Academic Integrity policy listed on page 11 of the academic catalog and student handbook. Be certain that you are knowledgeable about all of the policies listed in this syllabus, in the academic catalog and student handbook, and on the FAES website. As a student in this program, you are bound by those policies.

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### **Guidelines for Disability Accommodations**

FAES is committed to providing reasonable and appropriate accommodations to students with disabilities. Students with documented disabilities should contact Dr. Mindy Maris, Assistant Dean of Academic Programs.

### **Dropping the Course**

Students are responsible for understanding FAES policies, procedures, and deadlines regarding dropping or withdrawing from the course or switching to audit status.

### **Harassment**

FAES adheres to the NIH's harassment policies, which can be found at the following link:

<https://hr.nih.gov/working-nih/civil/statement-workplace-harassment>

Faculty and students in FAES courses are responsible for being familiar with the NIH's harassment policies and adhering to them.

### **Discussion Board Policies, if applicable:**

Students are encouraged to ask questions during the lecture hours and after lectures. Instructors will answer students' question as soon as possible.

### **Grading Scale and policy:**

Students will take one exam or will be asked to write a review from each instructor. Students are expected to submit their assignments on due day. For **late** submission, 15% will be deducted from the assignment score. Final grades will be calculated from the average score of all exams.

"A+" = 95-100 points

"A" = 91-94 points

“A-” =88-90 points

“B+” =85-87 points

“B” =80-84 points

“B-” =76-79 points

“C” =66-75 points

incomplete < 65 points.

### Weekly Course schedule

Lecture dates	Instructor	Lecture content	Assignment due
02/04/2020 Lecture one	Dr. Tiaojiang Xiao	General introduction of chromatin structure and current advances in the chromatin research field	
02/11/2020 Lecture two	Dr. Tiaojiang Xiao	Histone modifications (methylation, acetylation and phosphorylation) and the regulation of gene transcription	
02/18/2020 Lecture three	Dr. Tiaojiang Xiao	Histone ubiquitination and histone demethylation	
02/25/2020 Lecture four	Dr. Ghirlando Rodolfo	Chromatin architecture and nucleosome remodeling	
03/03/2020 Lecture five	Dr. Ghirlando Rodolfo	Polycomb complex and heterochromatin	

		structure Histone variants and the regulation of gene transcription-	
03/10/2020 Lecture six	Dr. Ghirlando Rodolfo	Student presentation	
03/17/2020 Lecture seven	Dr. Tiaojiang Xiao	Higher order chromatin organization and associated research tools (3C, 4C and 5C methods)	
03/24/2020 Lecture eight	Dr. Florencia Pratto	DNA demethylation and human diseases	
03/31/2020 Lecture nine	Dr. Daman Kumari	DNA methylation and genomic imprinting	
04/07/2020 Lecture ten	Dr. Daman Kumari	Non-coding RNAs and their biological role	
04/14/2020 Lecture eleven	Dr. Daman Kumari	Student presentation	
04/21/2020 Lecture twelve	Dr. Florencia Pratto	Functional roles of histone modifications in five different DNA repair pathways	
04/28/2020 Lecture fourteen	Dr. Kevin M. Brick	Genome-wide analysis of ChIP-seq and RNA-seq data with the UCSC web browser and Galaxy web server	

05/05/2016 Lecture fifteen	Dr. Kevin M. Brick	Genome-wide analysis of CHIP-seq and RNA-seq data with the UCSC web browser and Galaxy web server	
05/12/2016	Dr. Kevin M. Brick	Student presentation	