

# **PCB 6025-Molecular and Cellular Biology (MCB)-I**

## **Tentative lecture schedule (subject to change)**

Fall-2018, Tu and Th 12:30-1:45 pm in GC275A (Modesto Maidique Campus, MMC).

Prokaryotic and Eukaryotic Molecular Biology  
Dr. M. Alejandro Barbieri  
Office: AHC-1 318C

Hours: Tu-Th; 12:30 to 1:45 pm and by appointment ONLY.  
Email: [barbieri@fiu.edu](mailto:barbieri@fiu.edu)

Course Website: <http://www.fiu.edu/~barbieri>, click on teaching--PCB 6025.

### **COURSE DESCRIPTION**

This is a required course to provide graduate students with an in depth look at the structure and function of nucleic acids (DNA/RNA) during replication, transcription and proteins translation.

Topics include the basic principles of DNA replication, recombination, chromosomal variations, DNA transcription into RNA, mRNA translation to produce proteins, and small nuclear RNA including miRNA. Gene expression in: 1- viruses, 2- prokaryotes and 3- eukaryotes.

### **LEARNING GOALS (OBJECTIVES)**

To gain a solid knowledge on the molecular mechanisms, structure and functions of nucleic acids.

To understand gene expression and regulation: prokaryotes, eukaryotes and viruses.

To become familiar with appropriate vocabulary, primary literature and methods used by scientists to study Molecular Cell Biology.

### **TEXT**

The course will follow the book of Levin's Genes XI, Molecular Biology of the Cell by Bruce Alberts and Lehninger Principles of Biochemistry David L Nelson. Course material will also utilize review and original research articles.

Levin 's Genes XII by Jocelyn E. Krebs 12th Ed.  
ISBN: 978-1284104493

Molecular Biology of the Cell by Bruce Alberts 6th Ed.  
ISBN: 978-0815344322

Lehninger Principles of Biochemistry by David L Nelson 7th Ed.  
ISBN: 978-1464126116

Additional readings will be posted on the website. Although these will be announced in class, students are responsible for checking the class web page regularly for announcements and assignments. Students should bring.

### **ATTENDANCE AND PARTICIPATION IN THE CLASS DISCUSSIONS**

**Mandatory.** The first part of the course will cover Prokaryotic Molecular Biology; the second part will cover Eukaryotic Molecular Biology; the third part will focus on specific topics.

### **PEDAGOGICAL PHILOSOPHY**

Graduate students are adults able to not only absorb information but also are able to use this information to synthesize answers to novel questions. Graduate students know that writing is important: the most important aspect of a scientist's career are writing articles for publication, writing research grants and Nobel Prize acceptance speeches. Thus writing on exams and quizzes must be in complete English sentences to get complete credit. No extra credit will be given for superfluous information. Grades will be determined for performance over the entire semester.

### **GRADE**

Grade will be determined by exam, reading material, and presentation/participation in class of original research articles and their background information. The Department's Oral Presentation Scoring Rubric will be used for grading.

**Total Grade:** 100%

**Activity I:** 5%. (8/21/18)

Exercise activity

**Activity II:** 40%. (10/29/18-10/09/18)

Exams:

-Exam will be “open” and it will have 25 “**essay type**” questions and each question will have 3 to 5 sub-questions.

--Each correct answered question is equally weighted

--Exam date and time: **It will start at 11:00 am on 10/29/18 and it will finish at 11:00 am on 11/09/18.**

--**No make up Exam will be given, except in cases of unforeseeable and severe documented circumstances beyond your control.**

**Activity III:** 20%. (8/28/18-10/23/18)

Reading Material:

--Outside of some lectures by the instructors, the course will focus on review articles for discussion (reading material).

--Each student will write a specific “highlights” of the review paper assigned for each lecture.

--The language of each “highlights” should be clear, concise and to the point, and you should use **5 full sentences and each sentence should contain no more than 90 characters.**

--Each “highlights” is equally weighted

--Highlights deadline: **Each highlight has a specific deadline and they CAN NOT be sent via email.** Only hard copy will be accepted

	Deadline (12:30 pm)
Genome Engineering	8/28/18
Retrotransposons and genome regulation	9/4/18
Transcription Units	9/11/18
Chromatin and Enhancer	9/18/18
Nuclear organization	9/25/18
Nucleosome Structure and Function	10/02/18
mRNA degradation and splicing	10/09/18
The type II secretion system	10/16/18
The type III secretion system	10/23/18

--**No make up “highlights” will be given, except in cases of unforeseeable and severe documented circumstances beyond your control.**

**Activity IV:** 30%. (11/13/18-11/29/18)

Presentations: 20% and Participation: 10%.

--Students will select original research or specific review articles that have been published in **2018** on selected topic assigned by the instructor (see specific topics section in the syllabus section).

--Students must send 5 articles to the instructor **VIA EMAIL with subject: PCB6025**, who will select the article to be presented no later than **10/16/18**. The Instructor will then send the chosen article for each student no later than **10/25/18** together with **the exact day of the presentation**.

--Before each presentation (24 hrs), the presenter has to email to the whole class and instructor a ppt/pdf file of the PowerPoint presentation along with research paper. Each student will make a presentation (~25 minutes) on the research articles. Preparation for the presentation involves knowing well the article as well as any supplemental material.

--Presentation of the data should involve getting to know how the experiments were done so that data can be critically analyzed.

-- Each student will write a specific “highlights” of the paper presented in class.

**Activity V:** 5% (11/29/18)

Exercise activity

### **Grading system**

A: 90-100%

B: 80-89%

C: 70-79%

D: 60-69%

F: <60%

A grade of **IN (Incomplete)** will only be given in **extremely rare circumstances** where unusual circumstances occur after the Drop date. For a student to receive an **IN**, the

student must have completed at least half the course work and have a passing grade at the time of the incident. Professional documentation, including an address and telephone number must demonstrate that the student cannot complete the course due to factors beyond their control (severe illness, accident, death in the immediate family, etc.).

### **ADA ACCOMMODATION STATEMENT**

If the student has a documented disability as described by the Rehabilitation Act of 1973 (PL 933-112 Section 504) and Americans with Disabilities Act (ADA) and would like to request academic and/or physical accommodations, please contact the Disability Resource Center (tel. 305-348-3532, TTY/TDD 305-348-3852), as soon as possible. Course requirements will not be waived, but reasonable accommodations be provided as appropriate. It is then the student's responsibility to contact and meet with the instructor as early as possible.

### **BEHAVIORAL MISCONDUCT**

We (students and instructors) are responsible for maintaining an appropriate, orderly, learning environment in accordance with the mission of the University. Disruptive behavior will NOT be tolerated. All cell phones must be turned off. During exams all electronic devices must be turned off and put away. Students in attendance should listen and participate appropriately. Students who fail to adhere to the behavioral expectations outlined by the instructor and presented in the FIU Student Handbook may be subjected to discipline in accordance with the procedures described in the FIU Student Handbook. The student handbook also describes the University's policy on sexual harassment.

### **ACADEMIC INTEGRITY**

Collaboration is an important aspect of scientific discovery as well as learning. While it is encouraged that students study together and share information with partners as appropriate, all assignments should be written independently by each student (unless otherwise required for a group assignment). When appropriate, sources (including the internet and personal communication) should be cited. Cheating and plagiarism are serious offenses and are NOT acceptable. Plagiarism is the presentation of another's work or ideas (either published or unpublished) as one's own. This includes both quoting verbatim as well as paraphrasing ideas without appropriate citation. If found to have cheated or plagiarized, or have enabled someone else to do so, the student will be subjected to disciplinary action that will include receiving a zero that cannot be dropped for the assignment/exam. A second occurrence will result in the student receiving an **F** for the course. If you are aware of such academic dishonesty, report it to the professor.

## Tentative lecture schedule (subject to change)

<b>Date</b>	<b>Topics</b>
Week of 8/20/18	Introduction: Basics in Molecular Biology
Week of 8/27/18	Regulatory RNA Genome Engineering Discussion and highlights
Week of 9/3/18	Retroviruses and Transposons Retrotransposons and genome regulation Discussion and highlights
Week of 9/10/18	Promoters and Enhancers Transcription units Discussion and highlights
Week of 9/17/18	Activating Transcription/Epigenetic Effects Chromatin and Enhancer Discussion and highlights
Week of 9/24/18	Controlling Chromatin Structure Nuclear organization Discussion and highlights
Week of 10/01/18	Chromosomes/Nucleosomes Nucleosome Structure and Function Discussion and highlights
Week of 10/08/18	RNA Splicing and Processing/Enhancer: eRNAs and lncRNAs mRNA degradation and splicing Discussion and highlights
Week of 10/15/18	Gene Regulation Part- I The type II secretion system Discussion and highlights
Week of 10/22/18	Gene Regulation Part- II The type III secretion system Discussion and highlights

**Week of 10/29/18 to 11/05/18**

**Exam (Open Access)**

## **Special topics**

11/13/18

- 1-Prokaryotic Gene Regulation: CRISPR-Cas9 adapted for eukaryotic genome engineering and RNAi.
- 2-Eukaryotic Chromatin: Molecular mechanism of action of eRNAs and lncRNAs
- 3-The Mechanisms and Significance of mRNA Degradation: The Riboswitch control of bacterial metabolism

11/15/18

- 4-Retrotransposons: functions and regulations
- 5-Modification of Enhancer Chromatin: DNA methylation during cell differentiation
- 6-Mechanism of nucleosome survival: Histone methylation during cell proliferation

**Week of 11/20/17 to 11/24/17**

**Not Class-Thanksgiving**

11/27/18

- 7-RNA Splicing- SR Proteins; Enhancer: lncRNAs in cancer biology
- 8-Distant Activation of Transcription: Nucleosome positioning and gene regulation
- 9-Promoters- proteins involved in long-distance interactions. Chromosome and nuclear architecture

11/29/18

- 10-Enhancer: eRNAs in developmental biology
- 11- To be or not to be microRNAs: health and disease

**Week of 11/29/18**

**Re-take Exam  
(Close Book/Note Access)  
(Without Access to any electronic devise)**