

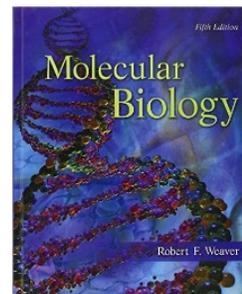
Syllabus  
**BIOL 4351 Molecular Biology**

Spring 2016

Wednesdays 9:00 AM – 11:50 AM; Room: B-2236

Prerequisite: Biochemistry I, Genetics, and/or equivalent  
Instructor: M. Bazlur Rashid, Ph.D.  
Office Hours: Suite B3525-14; Wednesdays 1:00 – 2:00 PM, or by appointment  
Contact info: Tel. 281-283-3756;  
E-mail: [rashid@uhcl.edu](mailto:rashid@uhcl.edu)  
Note: -Always use UHCL webmail account to contact by e-mails  
-Please use your full name in the end  
-Please write BIOL 4351 in the subject

**Text Book (Required):** Molecular Biology 5th Edition  
By Robert F. Weaver  
McGraw Hill 2012



**UHCL Quality Enhancement Plan (QEP):  
Applied Critical Thinking for Lifelong Learning and Adaptability**

- I. **Applied Critical Thinking Statement:** This course has been authorized by UHCL as an Applied Critical Thinking (ACT) Course which means that in addition to learning about the specified course content, students will be engaged with some or all of the Elements of Thought and Universal Intellectual Standards of critical thinking. The objective of an ACT course is to develop the student's ability to become skilled at analysis and evaluation by applying a set of intellectual tools that may be effectively used across all disciplines (as well as to the student's personal life). Based on the Foundation for Critical Thinking model (<http://www.criticalthinking.org/>), critical thinking involves thinking for a *purpose*, asking *questions*, using *information*, applying *concepts*, drawing *inferences and conclusions*, identifying *assumptions*, anticipating *implications and consequences*, and recognizing *points of view*. The Universal Intellectual Standards that are applied to these Elements of Thought of critical thinking in order to develop Intellectual Traits include *clarity, accuracy, precision, relevance, depth, breadth, logic, significance, and fairness*.
- II. **Course description:** This course should provide a **widespread** knowledge about how the cell as a basic unit of life function at the molecular level. We will **systematically** study and compare the structures of the genome in prokaryotes and eukaryotes and **precisely** define and identify basic elements involved in the regulation of gene expression. Explain or diagram the relationship in space between molecules of different cellular mechanisms, and **accurately** explain the consequences of those relationships for how the molecules work. Think critically about the normal function of genes and proteins, and reason from normal function to **specifically** and **accurately** explain disease conditions associated with mutated versions. Students should



be able to **comprehensively** read and understand the basic molecular/cellular techniques and **logically** explain scientific data from peer-reviewed journals. One of the **central questions** of molecular biology is to know how biological information is transferred bi-directionally between nucleic acids and proteins.

III. **Student Learning Objectives (SLOs):** Students successfully completing this course should be able to:

- 1) *Precisely* describe the **axioms (assumptions)** of the structures and their functions in the flow of information from genes to proteins.
- 2) *Clearly* understand how the gene expression are regulated in cells.
- 3) Clearly understand what gene mutation is and how that can affect protein production and its function
- 4) Will have *in-depth* **concepts** in Molecular Biology laboratory techniques e.g. DNA and protein analyses techniques, recombinant DNA technology and gene cloning, PCR and Southern and Western Blotting.
- 5) *Clearly* establish a firm connection between this course and other aspects of biology and *precisely* relate the knowledge in understanding genetic disease developments and following science magazines and so forth dealing with DNA, RNA and proteins.
- 6) Identify *relevant* **information** in the web or library on a molecular/ cellular biological issue, analyze and evaluate *properly* the scientific data, synthesize and conclude what are current notions in the area.

### **Fundamental and Powerful Concepts (FPC) of the Course**

In this course I will repeatedly mention about cellular macromolecules (DNA, RNA, and proteins) and their functional aspects in various cellular activities. Therefore, it will be very helpful if you know the following fundamental molecular *concepts*: DNA replication, gene transcription, and the messenger RNA translation.

- FPC#1: DNA Replication is the mechanism how the chromosomes are duplicated through new DNA synthesis. Please note a successful DNA replication is a prerequisite for a proper cell division; an area highly researched currently to answer the dilemma of cancerogenesis.
- FPC#2: Gene transcription is a mechanism where a gene in a chromosome is copied into a message (transcript), mRNA, involving promoters, regulatory elements and many proteins.
- FPC#3: The mRNA translation into proteins are performed in the ribosomes involving transfer RNA and many proteins.

### **Vocabulary of Critical Thinking:**

In this course, we will learn and use the vocabulary of critical thinking that will include an understanding and use of both 8 *elements of thought* and 9 *universal intellectual standards*:  
<http://www.criticalthinking.org/ctmodel/logic-model1.htm>

#### **• Elements of Thought:**

1. **Purpose** – goals, objectives

2. **Question at Issue** – problem, issue
3. **Information** – data, facts, reasons, observations, experiences, evidence
4. **Interpretation and Inference** – conclusions, solutions
5. **Concepts** – theories, definitions, laws, principles, models
6. **Assumptions** – presuppositions, axioms, taking for granted
7. **Implications and Consequences**
8. **Point of View** – frames of reference, perspectives, orientations

We will give full efforts to adopt the learning method SEE-I in this course:

- I. **State** (simply note the point)
- II. **Elaborate** (in other words ...)
- III. **Exemplify** (for example ...)
- IV. **Illustrate** (It's like .... Comparison, metaphor, analogy)

• **Universal Intellectual Standards:**

- 1) Clarity
- 2) Accuracy
- 3) Precision
- 4) Relevance
- 5) Depth
- 6) Breadth
- 7) Logic
- 8) Significance
- 9) Fairness

**CRITICAL THINKING PROCESS:**

Four major aspects of applied critical thinking are curiosity, connections, creativity and communication, termed 4 C's. In this course, we will focus primarily on *connections*.

IV. **Major Activities:**

1. There will be 2 exams, Midterm and Final, (**SLO 1, 2 and 4**) each covering 30% of the final grade. Exams will be based on class lectures and discussions. There will be 'a set of questions' in the tests addressing these SLO's where critical thinking will be infused by the students to give a correct answer.

Note: you will be asked to sit away from each other or reshuffle places during the tests. Exam questions may be short-essay, fill-ins, yes/no, and multiple-choice types. Midterm will focus on general molecular biology in terms of structures and functions and Final Exam will be more specific on the central dogma of molecular biology.

2. **Quizzes:** There will be 5 quizzes each covering 5% of the final grade. Quiz will be conducted at the beginning of the class. Worst quiz grade will be waived. (5x4% = 20%). Quiz will be only fill-ins, yes/no, and multiple-choice types.
3. Attendance and class participation covers 5% final grade.
4. Assignments (**SLO 5-6**) will cover 15% of the final grades. You will write a 3-4 page **review report** (Executive Summary style, 11 fonts, double spaced, not counting reference page) in your own words. The topic will be the same for all students. A primary article on a current biological issue relevant to molecular biology or cell biology will be picked for review writing. You will need to *clearly* explain the problem discussed in the article using terms used in the class, *precisely* analyze the data employing the *concepts* of molecular biology and *properly* conclude on your findings, and you also must include references in compiling information to make it a more comprehensive review. Please submit your assignments through Blackboard Safe-assign link. Assignments submitted late will not be evaluated for grading. The following web links will give some idea on the format of writing:  
[http://en.wikipedia.org/wiki/Executive\\_summary](http://en.wikipedia.org/wiki/Executive_summary) [http://ueberfachliche-kompetenzen.ethz.ch/dopraedi/pdfs/Mayer/guidelines\\_executive\\_summary.pdf](http://ueberfachliche-kompetenzen.ethz.ch/dopraedi/pdfs/Mayer/guidelines_executive_summary.pdf)

Please Note:

- Make up Exam/Quiz will be offered only to those who will serve valid excuses (e.g. Physician's note/ Employer's note). Make up test/quiz may be relatively difficult and different than actual ones and may comprise of only short essay type questions.
- In order to do well in this course, the relevant chapters from the book **MUST BE READ** before the lecture to get the grasp of the problems and to ask for clarification of concepts when necessary.

Class Grading:

- Midterm 30%
- Final Exam 30%
- Quizzes 20%
- Assignment 15%
- Class participation 5%

Grading Scale:

|    |        |    |        |    |        |
|----|--------|----|--------|----|--------|
| A  | 92+    | A- | 89- 91 |    |        |
| B+ | 85- 88 | B  | 80- 84 | B- | 78- 79 |
| C+ | 76- 77 | C  | 70- 75 | C- | 68- 69 |
| D+ | 66- 67 | D  | 60- 65 | D- | 58- 59 |
| F  | <58%   |    |        |    |        |

**Applied Critical Thinking (ACT) assessments will be done as follows:**

The tests and assignments (please see the table below) will be graded and an aggregate score for evaluation how well a student is doing on learning outcomes. The following assessment levels will be considered:

- 3 = Excellent: 90% and above
- 2 = Acceptable: 70% to 89%
- 1 = Unacceptable: 69% and below

| Activity                   | Targeted FPC   | Targeted SLO    | Targeted C |
|----------------------------|----------------|-----------------|------------|
| 1. Midterm and Final Exams | FPC 1, 2 and 3 | SLO# 1, 2 and 4 | Connection |
| 2. Review Report           |                | SLO# 5 and 6    | Connection |

### Use of Class Products in Assessment

The University of Houston–Clear Lake may use your work in this class to generate assessment data. Any works used will be used only for educational purposes.

### ACADEMIC INTEGRITY

HONESTY CODE: The Honesty Code is the university community's standard of honesty and is endorsed by all members of the University of Houston–Clear Lake academic community. It is an essential element of the university's academic credibility. It states: **I will be honest in all my academic activities and will not tolerate dishonesty.**

- The instructor assumes that the students' names on their submitted work imply compliance with this policy. See <http://uhcl.smartcatalogiq.com/en/current/Graduate-Catalog/General-Program-Requirements/Enrollment-and-Grading-Policies/Academic-Honesty-Policy>
- Students violating the code will be promptly reported to the dean and will have to sign a document admitting dishonesty: this document will be posted on their academic record.
- Accused students will **NOT** obtain letters of reference or opportunities for future TA/RA positions from your instructor.
- **Students with Disabilities:** Any individual registered with a disability that requires a special accommodation should inform the instructor. For questions or to register, contact the Disability Services office at 281-283-2626.
- **Incompletes and withdrawals:** The last date to drop this course without a grade penalty is **April 12, 2016**. In accordance with UHCL policy, an incomplete grade (I) can only be assigned if the student is making satisfactory progress, but cannot complete the course for a documentable reason
- **Six (6) Drop Rule Limitations:** - Students who entered college for the first time in Fall 2007 or later should be aware of the course drop limitation imposed by the Texas Legislature. Dropping this or any other course between the first day of class and the census date for the semester/session does not affect your 6 drop rule count. **Dropping a course between the census date (February 03) and the last day to drop a class for the semester/session will count as one of your 6 permitted drops.** You should take this into consideration before dropping this or any other course. Visit [www.uhcl.edu/records](http://www.uhcl.edu/records) for more information on the 6 drop rule

(<http://prtl.uhcl.edu/portal/page/portal/AR/6droprule>) and the census date information for the semester/session.

### Molecular Biology Spring 2016 Tentative Schedule

|                    |   |   |
|--------------------|---|---|
| <b>January 20</b>  | INTRODUCTION<br>Chapter 2<br>Chapter 3    | - The Molecular Nature of Genes<br>- An Introduction to Gene Function                                       |
| <b>January 27</b>  | <b>Quiz 1</b><br>Chapter 4                | - Molecular Cloning Methods   |
| <b>February 03</b> | Chapter 4                                 | - Molecular Cloning Methods (cont.)   |
| <b>February 10</b> | <b>Quiz 2</b><br>Chapter 5                | -Molecular Tools for Studying Genes and Gene Activity   |
| <b>February 17</b> | Chapter 6<br>Chapter 7                    | -The mechanism of transcription in bacteria<br>-Operons: Fine Control of bacterial transcription            |
| <b>February 24</b> | <b>Quiz 3</b><br>Chapter 8<br>Chapter 9   | -Major Shifts in Prokaryotic Transcription<br>-DNA-Protein Interactions in Prokaryotes                      |
| <b>March 02</b>    | <b>Chapter 10</b><br>MIDTERM REVIEW       | -Eukaryotic RNA Polymerases and Their Promoters   |
| <b>March 09</b>    | <b>Midterm</b>                            | 2 hrs. (9:30 – 11:30 AM)  |
| <b>March 16</b>    | <b>Spring break</b>                       | <u>No class</u>   |
| <b>March 23</b>    | Chapter 11<br>Chapter 12                  | -General Transcription Factors in Eukaryotes<br>-Transcription Activators in Eukaryotes                     |
| <b>March 30</b>    | <b>Quiz 4</b><br>Chapter 13               | -Chromatin Structure and its Effects on Transcription   |
| <b>April 06</b>    | Chapter 14<br>Chapter 15                  | -Messenger RNA Processing I: Splicing<br>-Messenger RNA Processing II: Capping and Polyadenylation          |
| <b>April 13</b>    | <b>Quiz 5</b><br>Chapter 17<br>Chapter 18 | -The Mechanism of Translation I: Initiation<br>-The Mechanism of Translation II: Elongation and Termination |
| <b>April 20</b>    | Chapter 20<br>Chapter 21                  | -DNA Replication, Damage and Repair<br>-DNA Replication II: Detailed Mechanism                              |
| <b>April 27</b>    | Lecture Extra day/Review                  |   |
| <b>May 04</b>      | <b>Final Exam</b>                         | 2 hrs. (9:30 -11:30 AM)   |