**ESSEX COUNTY COLLEGE**

**Biology and Chemistry Division**

**BIO 228 *–* Molecular Biology**

**Course Outline**

**Course Number & Name:**  BIO 228 Molecular Biology

**Credit Hours:**  4.0 **Contact Hours:**  6.0 **Lecture:** 3.0 **Lab:**  3.0 **Other:**  N/A

**Prerequisites**:  Grades of “C” or better in BIO 103 and BIO 104 **or** BIO 121 and BIO 122

**Co-requisites:** None **Concurrent Courses:** None

**Course Outline Revision Date:** Fall 2010

**Course Description:** BIO 228 is a study of the fundamental principles that guide cellular and molecular organization and function. Topics include membranes and cell signaling, the cytoskeleton and cell motility, the cell cycle, and regulation of gene expression. Laboratory sessions include the measurement of toxic effects of various chemicals on membrane integrity, practical applications of biotechnology to everyday problems, and the use of recombinant DNA technology to perform an authentic cloning experiment.

**Course Goals:** Upon successful completion of this course, students should be able to do the following:

1. describe the structure, function, and chemistry of cell membranes and explain how these characteristics relate to membrane transport and cell signaling;
2. describe the structure of the cytoskeleton and explain how the structure relates to cellular movement; and
3. describe and explain the flow of information in the cell from DNA to RNA and continuing through to protein synthesis.

**Measurable Course Performance Objectives (MPOs)**: Upon successful completion of this course, students should specifically be able to do the following:

1. Describe the structure, function, and chemistry of cell membranes and explain how these characteristics relate to membrane transport and cell signaling:

1.1 *describe cell membranes;*

1.2 *explain the role membrane lipids play in controlling membrane fluidity;* and

1.3 *discuss how membrane proteins direct membrane traffic and inside-out signaling and outside-in signaling*

1. Describe the structure of the cytoskeleton and explain how the structure relates to cellular movement:

2.1 *differentiate between the various proteins that make up the cellular cytoskeleton;* and

2.2 *relate cell migration and cellular embryonic development to cytoskeleton elements*

**Measurable Course Performance Objectives (MPOs)** (continued):

3. Describe and explain the flow of information in the cell from DNA to RNA and continuing through to protein synthesis:

3.1 *use DNA templates to synthesize RNA templates that will serve as templates for protein synthesis;* and

3.2 *discuss how the expression of genetic information is dependent on the colinearity of genes and proteins*

**Methods of Instruction**: Instruction will consist of lectures and laboratory activities. Lecture and lab materials, in addition to supplemental reading assignments, will be provided by the instructor in order for students to stay current with related scientific inquiry. Classroom discussion and interactive activities will be emphasized.

**Outcomes Assessment:** Exam questions are blueprinted to ensure that the objectives of the course are met by the students. Rubrics are used to evaluate lab reports and oral reports for the presence of course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives.  The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

**Course Requirements:** All students are required to:

1. Maintain regular attendance.
2. Maintain a scientific journal in accordance with scientific laboratory protocols.
3. Read all assigned material in advance so they are prepared to participate in all aspects of the course.
4. Present one oral report.
5. Complete all assigned in-class work and homework and submit all lab reports on time.All assignments/lab reports must be submitted on time. Except in extreme excusable emergencies, late assignments/lab reports will be penalized one grade point for every school day late. Assignments/lab reports will not be accepted one week or more past the due date. In the event of unforeseen difficulties, the student should discuss the problem with the instructor. In-class assignments must be typed, one-and-one-half to double-spaced 12 pt font on standard size paper. Students must retain first drafts and final copies of all assignments/lab reports until the graded originals have been returned.
6. Take all quizzes and exams as scheduled.

**Methods of Evaluation:** Final course grades will be computed as follows:

**% of**

**Grading Components final course grade**

* **6 or more Exams** (dates specified by the instructor) **80%**

Exams will show evidence of the extent to which student meet course of objectives, including but not limited to, identifying and applying concepts, and analyzing and solving problems.

* Oral Report   10%

Oral reports will assess the extent to which students meet course objectives. They will also allow students to explore current findings in molecular research and generate alternate explanations that could lead to new hypotheses.

* **5 or more Lab Reports**  **10%**

Lab reports will assess the extent to which students meet course objectives. Lab reports will also allow students to identify and apply concepts of the scientific method and follow correct laboratory procedures.

**Academic Integrity:** Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College.  Academic dishonesty includes, but is not limited to, the following:

* plagiarism – the failure to acknowledge another writer’s words or ideas or to give proper credit to sources of information; could result in a
* cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
* interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
* fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions.  Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

**Student Code of Conduct:** All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College’s Code of Conduct and attendance requirements.

**Course Content Outline:** based on the text **World of the Cell**, 13th edition, by Becker; published by Kleinsmith, Hardin & Bertoni. 2010; IBSN #: 0321527488; and **Laboratory Manual**, Shoestring Biotechnology: NABT, Monsantofund NSF, Biotechnology.

**Week Class Topics Assignments**

1 Class introduction, review of class syllabus, Oral Reports assigned

course overview

Lab: Basic safety and techniques

2 Structure, function & chemistry of

membranes (ch 7)

Lab: Cytotoxic activity and brine shrimp

3 Transport across membranes (ch 8)

Lab: Enzymatic activity in detergents **Lab Report due**

4 Chemical signals & cellular receptors (ch 14) **Exam 1**

Lab: Enzymatic activity in detergents

(continued)

5 Chemical signals (continued): growth

factors & hormones

Lab: Textile processing **Lab Report due**

6 Extra cellular structures, cell adhesions & **Exam 2**

cell junctions (ch 17)

Lab: Textile processing (continued)

7 Intracellular compartments: roles of ER &

golgi complex (ch 12)

Lab: Textile processing (continued)

8 The structural basis of cellular information: **Exam 3**

DNA chromosomes and the nucleus (ch 18)

Lab: Extraction of genomic DNA from spinach **Lab Report due**

9 Cell cycle and DNA replication (ch 19)

Lab: Explanation of genetic engineering

techniques & materials

10 Mitosis and cancer (ch 19) **Oral Reports begin**

Lab: Production of recombinant plasmid

with spinach DNA

**Week Class Topics Assignments**

11 Gene expression: protein synthesis and **Exam 4**

sorting (ch 22)

Lab: Transformation of bacterial cells with **Oral Reports** **continue**

previously constructed recombinant plasmid

12 Regulation of gene expression (ch 23)

Lab: Transformation of bacterial cells with

previously constructed recombinant plasmid

(continued)

13 Cytoskeleton systems (ch 15) **Exam 5**

Lab: Evaluation of results **Lab Report due**

14 Cytoskeleton systems (continued)

Lab: Cellular movement: motility (ch 16)

15 Cellular movement: contractility (ch 16) **Exam 6**

**Lab Report due**