

BME 303: Biological and Chemical Foundations of Biomedical Engineering

3 Credits, 3 Contact hours

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Office Location: CHEN Building, Room # 120

Prerequisites:

BME 111, Chem 126, Phys 121

This is a required course for all BME undergraduate students.

Course Syllabus: Fall Semester of 2015

Week & date	Lecture Topic	Reading Material	Assignments
Week 1	Overview of the course and introduction to living cell diversity	PPT lecture	
Week 2	Cell division cycles	PPT lecture	Quiz
Week 3	Cell structure, organelles and functions	PPT lecture	Quiz
Week 4	Cell membrane structure and nutrient transport mechanisms	PPT lecture	Quiz
Week 5	Metabolism of nutrient in the cytoplasm and in mitochondria.	PPT lecture	Quiz
Week 6	The nuclear membrane and the chromatin	PPT lecture	Quiz
Week 7	The nucleic acids in chromatin	PPT lecture	Quiz
Week 8	DNA replication	PPT lecture	Quiz
Week 9	The RNA synthesis	PPT lecture	Quiz
Week 10	The small RNA and epigenetic	PPT lecture	Quiz
Week 11	Protein structure and enzymatic functions	PPT lecture	Quiz
Week 12	Cytoskeleton proteins & functions	PPT lecture	Quiz
Week 13	Intracellular cell signaling	PPT lecture	Quiz
Week 14	Cellular interactive communication	PPT lecture	Quiz & journal assignment
Week 15	Final exam , & Journal discussion		

Lecture duration: Each lecture is designed for 3 hours class.

Course Grading:

Class Attendance: 10%

Quizzes: 60%

Journal discussion: 10%

Final Exam: 20%

Course Description:

The course “Biological and Chemical Foundations of Biomedical Engineering” introduces the biomedical students a basic concept of cellular biochemistry and molecular biology in a well-organized systematic intracellular compartments. The lecture series are designed in an orderly manner that students will have an easy understanding of a human biochemistry complexity within a self-organized cellular structure. The lecture series will adequately explain how replication and translation of simple nucleic acid base can transform into a functional protein to successfully integrate the biological signals in an energy dependent manner. The objective of the course is to enrich the students with fundamental biochemistry and molecular biology knowledge for successful application of engineering principles to biomedical advancement.

Assignment:

As an interactive learning to scientific research communications, students will be given a challenge project to critique the soundness of the title, hypothesis, experimental approach, data interpretation and conclusion, statistical evaluation, and novelty of the findings of selected peer-reviewed articles. This will be an open discussion like in journal club. Students will not submit any write-up material.

Quizzes and Final Examination: There will be 13 quizzes during the semester. Each quiz will carry five points. The sum of the highest 12 quizzes points (i.e. a total of 60 points) will be the final score. The lowest score of the quiz will be dropped. There will be no make-up quizzes. If any student will miss a quiz, that will be the dropped quiz. All quizzes and exam questions will be asked strictly from the course materials covered in the lecture series only.

Textbook(s)/Materials:

This course does not require textbook. The main course materials will be the power point lecture handouts, which will be provided via the Moodle portal to this course, and can be accessed in <http://moodle.njit.edu/>. Students are encouraged to read the following two books for more challenging knowledge.

- (1) Essential Cell Biology. Alberts et. al., 3rd edition [Garland Science], ISBN Number (ISBN-10:0815341296).
- (2) Principles of Biochemistry - 5th edition, by Robert Horton (2011, Pearson Publisher), (ISBN13: 978-0321707338).