CHE311 Foundations of Biological Science for Engineering
Fall 2012
Instructor Prof. Victor Perez-Luna
232 Perlstein Hall,
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Class meetings Tuesdays & Thursdays 10:00-11:15 am, 116 Wishnick Hall
Office Hours Wednesdays 2-3 pm

Teaching Assistant: Sogol Hekmatfar, shekmatf@hawk.iit.edu email for consultation

Required text for CHE311: Essential Cell Biology, 3rd Ed.
Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts & Walter, 2009 (Call #: REF.QH581.2.E782004)

Other useful references:
Molecular Cell Biology, 5th or 6th Ed.
H. Lodish , A. Berk , L. Zipursky, P. Matsudaira, D. Baltimore, J. Darnell
W. H. Freeman, 2007(Call #: QH581.2.M6552003) in reserve

Introduction to Protein Structure
C. Branden & J. Tooze
2nd Ed. (Call #: QP551.B76351999) in reserve

Biochemical Engineering Fundamentals
J.E. Bailey & D.F. Ollis, , 2nd Ed.,

Works drawn from the chemical, biological and engineering literature will supplement the above text.

Course Learning Objectives
By the end of the term you should be able to have a better understanding of:
1. Cell and structures in the cells (organelles)
2. Analytical tools used in biology.
3. The chemical components of cells.
4. The types of bonds and their roles in the structure of biological molecules
5. The fundamental role that inter- and intramolecular interactions play in how bio-molecules and biomolecular systems work.
6. Catalysis in biological systems
7. The concept of energy in biological systems
8. The concept of entropy in biological systems
9. The process of DNA transcription and RNA translation at the molecular level
11. How cells communicate and work together.

You should also be able to extract, understand and communicate key idea(s) from any work of the current biotechnical literature.
Student learning Objectives
1. Identify the different organelles in cells and different cell types.
2. Examine biological literature and identify the tools of cell biology used to obtain the data.
3. Know the structure of biological molecules
   a. Draw and identify the structures of simple sugars such as glucose, sucrose
   b. Distinguish DNA and RNA
   c. Draw the 20 amino acids
4. Know the difference between covalent and non-covalent bonds, their roles in biological molecules and how bonding influences the function of biological molecules.
5. Identify how activated carrier molecules (ATP, NADPH) drive biological reactions.
6. Understand what an enzyme is.
7. Understand the expression of Michaelis Menten Kinetics and determine the constants of this expression given experimental data.
8. Understand what a buffer is and how it works.
9. Identify primary, secondary and tertiary structures of different biological molecules.
10. Know the major players involved in the protein production in cells.
11. Know the major biosynthetic pathways in aerobic metabolism and the key molecules.
12. Understand how cells work together to influence tissue function and disease.

Term schedule (subject to change)

WEEK OF - TOPIC
1. Aug 20 - Introduction to cells (Ch. 1)
2. Aug 27 – Introduction to cells, Chemicals of Life (Ch. 2)
3. Sep 03 - Chemicals of Life
4. Sep 10 - Chemicals of Life
5. Sep 17 - Energy, catalysis and biosynthesis (Ch. 3)
6. Sep 24 - Energy, catalysis and biosynthesis
7. Oct 1 - Protein structure and function (Ch. 4)
8. Oct 8 – Protein Structure and Function, Midterm
9. Oct 15 - DNA and chromosomes (Ch. 5), DNA: Replication, repair and recombination (Ch. 6)
10. Oct 22 - DNA: Replication, repair and recombination, DNA to Proteins (Ch. 7)
11. Oct 29 - DNA to Proteins
12. Nov 5 - DNA to Proteins
13. Nov 12 – Biosynthetic pathways (Ch. 14)
14. Nov 19 – Biosynthetic pathways
15. Nov 26 - Cellular Communities: Tissues, stem cells and cancer (Ch. 20)
16. Dec 5 - Final Exam (8-10 am)

Grading
Class participation 5 %
Quizzes 10 %
Midterm 30 %
Final exam 55 %

Policy on exams and grading
Reasonable accommodations will be made for students with documented disabilities. In
order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources. The Center for Disability Resources (CDR) is located in Life Sciences Room 218, telephone 312 567.5744 or disabilities@iit.edu. There will be no make-up exams or quizzes unless the student provides documented evidence of the reason they were unable to make it for the scheduled exam. These include:

(i) A towing receipt – if your car broke down on the way to the exam. It must show a date and time.
(ii) A valid doctors note with date and time.
(iii) A funeral notice showing date and time of the funeral (and preferably your relationship to the deceased) you have to attend a funeral.

Please note that the midterm and final exams will not be curved. If you have any grievances on the exam and would like the exam to be graded again, please provide a written request together with your exam stating why you think that you were unfairly penalized on a particular question. Please note that in such an instance grading will be carried out on the entire exam and may cost you valuable points. Class participation will be awarded with extra credit points. These are taken into account during the cumulative assessment but will not be more than 5% of the total grade.

Generally (and in accordance with IIT guidelines), an overall score of above 90% will qualify for an “A”; 80-90% will qualify for a “B”; 65-80% will qualify for a “C”; 50-65% will qualify for a “D”; below 50% will result in an “F”. Borderline cases will be gauged on a case-by-case basis by observing the trends in scores – a steady improvement through the latter half of the course will result in a move up to the next higher grade. A reverse trend will result in the lower grade being awarded. Note that in rare circumstances, these criteria may be relaxed at the discretion of the instructor.

Policy on academic misconduct
Academic misconduct will not be tolerated and will be treated according to IIT guidelines. In the case where academic misconduct is observed or suspected, the exam will be stopped immediately and the case will be reported to the Dean of Armour College and of Students.

Cases of academic misconduct include but are not limited to:

1. Using your cell phone or other unauthorized material during a test/quiz/exam
2. Sharing your work with a nearby student during a test/quiz/exam
3. Any two exams that are identical and where the students were sitting near each other.

To minimize cases of dishonesty the exam proctor will ask students to move or create space between desks. Only pens and pencils will be allowed. For the midterm and final, one A4 piece of paper is allowed with your notes (you can write on both sides). All bags, books, jackets, etc should be placed underneath the seat beneath you. Writing material will be provided.