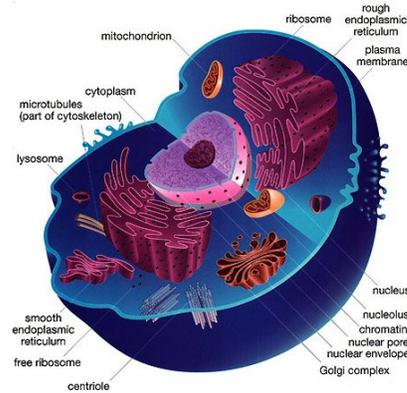
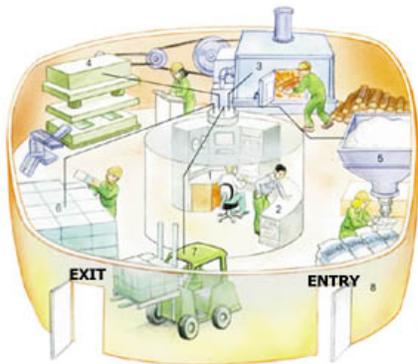


Course title: Cellular Machinery



Course Syllabus

Course number: CHE 480
Credit hours: 3
Semester/year: Fall/2013
Meeting days: M, W, F- 11-11.50 a.m.
Room location: 401 ESB
Prerequisites: Junior Standing and BIOL 115 or Consent
Instructor: Cerasela Zoica Dinu
Assistant Professor Department of Chemical Engineering
College of Engineering and Mineral Resources

Office location: ESB 445
Office phone #: 304-293-9338
Office hours: T/Th: 9-10 a.m.
E-mail address: cerasela-zoica.dinu@mail.wvu.edu

Course description:

By teaching the fundamentals of cell structure, organization and function and how the interactions within the cells are instrumental in understanding the cellular machineries, this multidisciplinary course provides an overview of the “cell like a chemical factory”. The course reveals practical examples of how cellular components can be manipulated in synthetic environment for applications in biology, bioengineering and biosensors, and emphasizes the importance of understanding “the cell” for biomedical applications and therapies.

This is an eligible elective course for those pursuing the Biomedical Engineering Certificate. It will be offered every year in the Fall semester.

Student learning outcomes:

Upon successful completion of this course, **Students will be able to:**

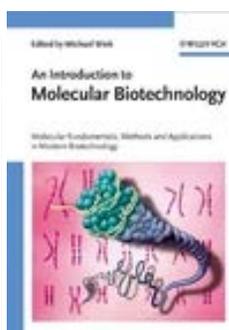
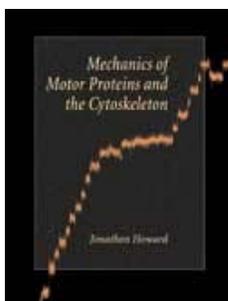
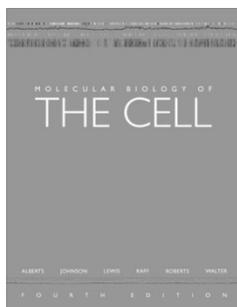
1. Understand and explain the metaphor: “The cell is a chemical factory” by outlining historical and structural, etc., aspects of the cell
2. Analyze the relationship between structure and function of cells and cellular components

both *in vivo* and *in vitro*

3. Describe the fundamental chemistry of living cells and cellular networks
4. Evaluate the flow of energy and matter in cellular function
5. Evaluate how the transport of materials inside and outside of the cells enables homeostasis
6. Relate principles of evolution to biological diversity
7. Define the modification in the cellular structure and function as result of the cellular exposure to toxicological environments
8. Rate the applicability of different correlations between cellular machineries and synthetic machineries

Required text: None required

Reference texts:



1. "Molecular Biology of the Cell" (Alberts et al.)
2. "Mechanics of Motor Proteins and the Cytoskeleton", (Howard)
3. "An Introduction to Molecular Biotechnology" (Wink)

Related textbooks should be available at the Evansdale Library. Students are encouraged to read outside the assigned class reading; suggested topics will be presented with the class material. Throughout evaluation of the available literature will help with understanding and integrating the material. If you do not read outside the assigned class readings, your grasp of the material will be average.

Course assessment/measures:

Tests/Final Exam:

The tests will cover the material presented in the class and the homework of suggested readings. The final exam will cover the entire semesters work. No collaboration is allowed during any of the tests or final exam.

Presentation:

Topics will be assigned (see calendar). Undergraduate students must submit a two pages paper outlining the assigned topic. For this, the students will be required to perform a literature background of 10 relevant scientific papers (DOI's- classical tools such as PubMed or Web of Science will be used as searching modules for the relevant literature). Presentations will be 10 minutes long with 5 minutes for questions (conference format). The purpose of the presentation is to give students an opportunity to evaluate and apply their knowledge and become more proficient in oral and written communication. Students are expected to answer questions from their peers and the professor during their presentation time.

Grading criteria:

The nominal grading scale is	≥90%	A
	≥80%	B
	≥70%	C
	≥60%	D
	<60%	F

At the instructor's discretion, the required values for a given grade may be lowered, but not raised.

The final grade for the course will be determined as follows:

Four Quizzes @ 12.5%	50%
Final Exam	20%
Class Participation	10%
Project/Presentation*	20%
Total	100%

*You must be in the audience for all of the projects/presentations. Failure to do so will result in reduction by one full letter on your project/presentation grade.

General about course grading:

If you believe that an error was made in grading your test/exam, you should see me during the office hours. Write a short justification of your claim and attach it to the original graded in question. Place the justification and the graded exam in my mailbox. Your concern will be reviewed and I will respond to you directly during the office hours. Note that for the exam, the entire exam will be re-graded not only the point in question.

Other course policies:

- The course lectures will introduce each topic and ideally present the material in a context different from the texts. Material presented in the lecture is unique and will be included in testing.
- A portion of the in-class lecture time will be devoted to open courseware and may include visuals, class activities, and assignments in groups related to the topic that is being presented. Note that for students miss any classes, related class materials will not be available online, thus the student will not benefit from the 10% class participation grade as stipulated in grading (see above). You might find questions in quizzes from such presentations.
- Office hours are meant to correct fundamental conceptual problems and to not act as a problem solving session.
- There are no make-up exams and a late assignment means no assignment.
- Any classes canceled due to inclement weather (or for any other reason, such as fire alarms) will be rescheduled. If the fire alarm goes off during an exam, the resolution of the situation is solely at the discretion of the instructor.
- Your cellular phone should be turned off during class. If your cellular phone rings during class, if you are observed texting during class, or if you are observed using the internet during class, your final grade will be reduced by one percentage point, and you will be asked to leave the class and not return on that day. You will still be responsible for all material covered in class. If you are observed texting or using the internet during an exam, you will automatically receive a zero for that exam.
- Project/presentation assignments that are obviously copied will receive no credit. Credit will be deducted for sloppy work that is hard to follow.

Disability:

If you believe that you have a disability that may affect your performance in this course, it is your responsibility to contact the WVU Office of Disability Services at (304) 293-6700. Written documentation from Disability Services must be provided to me in-person before any accommodations can be granted. If you are authorized for and wish to receive accommodations for an exam, you must notify me at least one week in advance. If you do not arrange accommodations in advance, they will not be given. Any rescheduled exams must be taken during the same calendar week (Monday-Friday) as the original date.

Social justice:

West Virginia University is committed to social justice and fostering a nurturing learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

Academic integrity:

Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts that violate this trust undermine the educational process. The integrity of the classes offered by West Virginia University solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code . Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me *before* the assignment is due to discuss the matter. The WVU Handbook of Student Rights and Responsibilities define various forms of Academic Dishonesty and you should make yourself familiar with these. It is possible that you will work with other class members to complete your assignments. All submitted work must be your original work and must be clearly indicate with whom you have collaborated. If you have any question concerning this policy before submitting an assignment, please ask for clarification. All matters of academic integrity are to be brought to my attention immediately. Value for honesty, integrity, self-discipline, respect, responsibility, punctuality, dependability, courtesy, cooperation, consideration, and teamwork would be emphasized as an integral part of this class learning. A grade of zero will be given on the first assignment where a violation is detected. All cases of academic misconduct will be submitted to the Office of Student Conduct; if you are found guilty of academic misconduct you will be on academic integrity probation for the remainder of the years at WVU and may be required to report your violations on future professional school applications.

Examples of cheating:

- It is cheating to give another student access to your directory and your account for copying any of the homework assignments. Your campus account is for your use alone.
- You will be assigned topics during week 7 of this class. It is cheating for you and another student to work on the same presentation (on the same topic) and for both of you to submit it as your own work.

Approximate Course Calendar

This is a tentative schedule and subject to change depending upon the progress of the class.

Date	Tentative Class
08/19	Introduction Evolution and constant change
08/21	The history of cell theory Universal features
08/23	Cell like a chemical factory
08/26	Cell chemistry and biosynthesis: chemical processes
08/28	Proteins: shape, structure, functions
08/30	Catalysts, catalysis and the use of energy by cellular machines
09/02	University Holiday: Labor Day
09/04	Proteins/catalysts in synthetic environment- manipulation and applications
09/06	Test (end of cycle 1)
09/11	DNA- Discovery and structure DNA replication, repair and recombination (I)
09/13	DNA replication, repair and recombination (II)
09/16	Gene and controls: bio and chemical Gene expression
09/18	From DNA to RNA/ RNA and the origin of life
09/20	Protein Expression/Purification Applications in synthetic environment
09/23	Manipulation of DNA/ RNA in synthetic environment Origami Nanoelectrical networks
09/25	Test (end of cycle 2)
09/27	Visualization of cells in synthetic environment (e.g., TEM, SEM, Optical Microscopy, AFM etc.) (I)
09/30	Guest lecture/lab demo: Visualization of cells in synthetic environment (e.g., TEM, SEM, Optical Microscopy, AFM etc.) (II)
10/02	Internal organization of the cell Active and passive transport- chemical processes in membrane
10/04	Cellular compartments manipulation in synthetic environment
10/07	Energy conversion and applications
10/09	Cell communication; cell-cell interactions studied in synthetic environment
10/11	Test (end of cycle 3)
10/14	University Holiday
10/16	Cytoskeleton: mechanical role in the cell
10/18	Microtubules as tracks for motor proteins
10/21	Molecular motors/ Steps and forces/ Biomachines
10/23	Actin as molecular motors to convert chemical energy into mechanical work
10/25	Manipulation of cytoskeleton in synthetic environment for biosensors and bioengineering applications
10/28	Cytoskeleton and roles for therapies
10/30	Lab on a chip- cell manipulation and applications

	Topics titles discussed
11/01	Guest lecture
11/04	AIChE: No class
11/06	Test (end of cycle 4)
11/08	Guest lecture
11/11	Follow up on guest lectures Test results Topics due
11/13	Cell cycle
11/15	Cell division
11/18	Control cell division and cell cycle and implications for therapies Topics approved
11/20	Context: Cell versus tissue versus organ
11/22	How to give a good presentation The importance of considering cells as machineries: conclusion
11/25	Thanksgiving
11/27	Thanksgiving
11/29	Thanksgiving
12/02	Student Projects
12/04	Student Projects
12/06	Student Projects
12/09	Last Day of Classes: Course Review
12/12	Final 11:00 a.m.-1 p.m.