Course Outline
Biochemistry 4000
Nanomachines in Biochemistry
Spring 2011

Time: TBC
Location: TBC

Contact Information

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Office Hours: Friday, 9:00 – 10:30 h or by appointment

General Description: Nanotechnology is thought to be a new revolutionary field in science with many applications in everyday's life, but the defined construction of nanomaterials remains challenging. Interestingly, nature has long solved these problems as many cellular components can be regarded as highly efficient nanomachines. Examples range from three dimensional scaffolds such as virus coats, to molecular motors such as myosin, kinesin and the F1-ATPase, to sensors such as rhodopsin detecting light etc. In this course, we will look at some of the remarkable examples in nature for sophisticated nanomachines. We will also consider how this basic biochemical knowledge can be used to construct bionanomachines with desired functions. Therein, we will discuss nanoparticles built from nucleic acids, the wide range of applications of engineered fluorescent proteins and how new functions can be developed by *in vitro* selection or rational design. We will conclude with current topics such as nanomedicine, genetically engineered machines and other interesting publications in the field of bionanotechnology you would like to discuss.

Lecture Outline:

1. Nanostructures built from nucleic acids
    a. RNA 2D structures
    b. DNA 3D structures
2. Fluorescent proteins
    a. Green-fluorescent protein (GFP)
    b. Engineered fluorescent proteins
3. Molecular Motors and their application in nanobiotechnology
    a. Kinesin
    b. Myosin
4. Engineering new nanobiomachines
    a. *in vitro* selection
    b. rational design
5. Light Sensors such as Rhodopsin
6. Current Topics
    a. Nanomedicine
    b. Genetically engineered machines (iGEM)
    c. other

Prerequisites: 2 courses in biochemistry of which one has to be at the 3000 level (i.e. Bchm 3100 or 3300)

Textbook: Biochemistry, Voet & Voet, 3rd Edition (used in all Bchm Courses)
Additional, mandatory material such as Reviews and original Publications will be made available through the course webpage.

Class Website: http://classes.uleth.ca/201001/bchm4000a/
Lecture notes and publications will be posted latest on the morning before class. The website will also provide answer keys for exams, and grading statistics.
Attention: The posted lecture notes may not be complete and may contain clearly marked empty sections in order to encourage you to attend class and to understand the discussed topics. If you missed a class, it is your responsibility to either obtain completed lecture notes from your fellows or to find the missing information in the textbook / the relevant publication.

Exams and Grading:

1st Presentation	15 %	
2nd Presentation	15%	
1st Midterm (50 min)	15 %	February 10th
2nd Midterm (50 min)	15 %	March 24th
Participation in Class	10 %	
Final Exam	30 %	April 28th

Every student will have to present two times a current research publication (50 min presentation). The first publication will be provided by the instructor; the second can be chosen by the student upon consultation with the instructor. Evaluation of participation in class includes reading the research publication under discussion.

Approximate Grading Scale*:

A	86 – 100 %
B	74 – 85 %
C	62 – 73 %
D	50 – 61 %
F	< 50 %

*The exact grading scale will be determined by the instructor after the final exam.

Please Note: You must attempt every Midterm. If you miss an exam without valid excuse, this will automatically result in a score of 0. In case you have a good reason for missing an exam, you have to discuss this as soon as possible with your instructor (instructor's discretion). In case of illness, provide a medical certificate. In these cases, the final exam will be pro-rated to reflect the missed midterm.
Please inform your instructor IMMEDIATELY, if you have a very good reason for missing class on the day your presentation has been scheduled! You have to repeat your presentation as soon as possible after the missed class, preferably in the next class. The final exam can NOT be pro-rated to reflect a missed presentation, rather you will obtain a score of 0 if you are not at all available to present.

Student's Responsibility: It is your responsibility towards the other students in the class that you are fair when writing an exam. If you are caught cheating in an exam, you will be assigned a grade F instantaneously, and the rules outlined in the calender will be strictly followed. In order to ensure a fair environment for everybody, you are strongly encouraged to immediately report to the instructor in a discret way if you observe somebody else cheating.