

FACULTY of SCIENCE

Department of Physics and Astronomy

Course: SC/BPHS 2090 3.0 (crosslisted to SC/BIOL 2090 3.0) – **Current Topics in Biophysics**

Course Webpage: <http://www.yorku.ca/bphs>

Term: Fall Term 2014/2015

Prerequisite / Co-requisite: SC/PHYS 1010 6.00 or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00; SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 or SC/BIOL 1410 6.00.

Course Instructors:

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Time and Location

Lectures TR 11:30 AM–1:00 PM Stong College 218

Course Description

An introduction to biophysics highlighting major themes in pure and applied biophysical research. Included is coverage of fundamental concepts in fluid mechanics. The course will present students with an overview of the role of physics in biological research. Three lecture hours. One term. Three credits.

Expanded Course Description. This course will introduce students to biological physics. The current topics format gives the course directors latitude to choose topics that illuminate both biology and physics, and to bring in guest lecturers from many disciplines that require a biophysics background. Sample Topics: life and cycle, biomechanics, biological pumps, nanomotors, molecular spectroscopy, laser biophysics, nuclear physics and nuclear magnetic resonance. Guest lectures may include bio-imaging, high energy particle beam applications in biology, nuclear magnetic spectroscopy etc. For Biophysics majors: Concepts surveyed in this course will be further expanded in the third and fourth year biophysics courses. For Biology and other majors: Students are expected to be comfortable with introductory calculus.

Organization of the Course. The course involves formal lectures by the lecturers and guest lecturers. The lectures are central to the course. Lectures serve to enrich, clarify, and illustrate crucial current issues biophysics, with a primary focus on the application of physical approaches to biological problems. The material is reinforced by take-home assignments, gists of guest lectures and term tests.

Course Learning Objectives. Please note that a detailed syllabus of lecture material and past assignments and tests on the course website (www.yorku.ca/bphs) provide a highly detailed and practical presentation of the Learning Objectives.

Brief statement of the purpose:

The objectives of the course are to give students the opportunity to integrate the knowledge they gained in first year biology and physics courses into an interdisciplinary exploration of biological problems amenable to physics-based analysis, and to expose students to modern topics in biophysics. Specifically:

- Students are presented with case studies of current biological problems and the physical approaches used to solve them. These case studies are used as the foundation for assignments and test questions that require students to apply what they have learned to solve open-ended problems.
- Students learn pertinent aspects of foundational physics knowledge, and then apply that knowledge to relevant biological problems. Students are then given an in depth opportunity to solve work problems using fundamental physics-based knowledge in assignments and tests.
- Finally, students are introduced to current topics through guest lectures, and given the opportunity to synthesize what they learned into informative summary gists.

These three approaches intermesh in a framework of knowledge that encourages students to apply and integrate their understanding to novel biological problems using interdisciplinary problem solving.

Brief list of specific learning objectives of the course

The specific objectives of the course are that students will be able to:

- Critically examine the diversity of major organismal groups with reference to their usefulness as models for biophysical research.
- Understand key physical approaches that can be used to understand the how the form and function of diverse biological organisms are limited by physical constraints.
- Obtain detailed knowledge of the diversity of foundational physics that is relevant to biological processes.
- Develop their independent ability to apply their knowledge of biophysics to new biological problems and goals.

Course Text / Readings

Lew, R.R. and S. Jerzak (2014) Course Notes for Current Topics in Biophysics

(Detailed handouts and pdf files will be available on the Moodle website to provide the students with basic knowledge that is then expanded on in lecture.)

Evaluation

- Two term tests (30% total) and a final exam (40%)
The term tests will be held on the 9th of October and 18th of November)
- Assignments (20%)
- Guest lecture gists (10%)

In the event of an absence from a term test, please provide a letter stating that you were absent, and acknowledging that the weight of the missed term test (15%) will be added to the weight of the final exam.

“Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.”

Grading: The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.). Assignments and tests* will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 90, B+ = 75 to 79, etc.). For a full description of York grading system see the York University Undergraduate Calendar - <http://calendars.registrar.yorku.ca/2013-2014/index.php>. Students may take a limited number of courses for degree credit on an ungraded (pass/fail) basis. For full information on this option see Alternative Grading Option in the (*Faculty of Science and Engineering*) section of the Undergraduate Calendar.

Assignment Submission: Proper academic performance depends on students doing their work not only well, but on time. Accordingly, assignments for this course must be received on the due date specified for the assignment.

Lateness Penalty: Assignments received later than the due date will be penalized (usually 10% for the first day, 20% for the second, 40% for the third, ad infinitum).

Missed Tests: Students with a documented reason for missing a course test, such as illness, compassionate grounds, etc., which is confirmed by supporting documentation (e.g., doctor's letter) will have the weight of the missed term test transferred to the final exam.

IMPORTANT COURSE INFORMATION FOR STUDENTS

All students are expected to familiarize themselves with the following information, available on the Senate Committee on Academic Standards, Curriculum & Pedagogy webpage (see Reports, Initiatives, Documents) - <http://www.yorku.ca/secretariat/senate/committees/ascp/index-ascp.html>

- Senate Policy on Academic Honesty and the Academic Integrity Website
- Ethics Review Process for research involving human participants
- Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities
- Student Conduct Standards
- Religious Observance Accommodation

18 August 2014