



COURSE OUTLINE

1. **Course:** BCEM 553, Molecular Biophysics - Winter 2019

Lecture 01: MWF 11:00 - 11:50 in SA 147

Instructor	Email	Phone	Office	Hours
Sergei Noskov	snoskov@ucalgary.ca	403 210-7971	BI 411	MWF, 13:00-14:30

Course Site:

D2L: BCEM 553 L01-(Winter 2019)-Molecular Biophysics

Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Biochemistry 341 or 393; and Biochemistry 471 or Chemistry 371.

Note(s):

- a. Prior completion of Biochemistry 555 is strongly recommended. Also known as: (formerly Biology 553)

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date
Assignments (5*6 %) *	30%	
Midterm (In Class)	35%	March 1st, 2019
Final Examination **	35%	TBD

* Please see course outline for the due dates of each assignment

** 2 hours written exam as scheduled by the Registrar Office

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	79%	75%	71 %	68 %	65%	60%	55 %	50 %

4. **Missed Components Of Term Work:**

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section N.1](#); for more information regarding the use of statutory declaration/medical notes, see [FAQ](#)). Absences must be reported within 48 hrs.

The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize themselves with these regulations. See also [Section E.3](#) of the University Calendar.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Recommended Textbook(s):

Phillips, R, Kondev, J, Theriot, J., *Physical Biology of the Cell*: Garland Science.

Ken Dill and Sarina Bromberh, *Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics and Nanoscience*: Garland Science.

2nd Edition, Garland Science, ISBN 9780815344308 - CAT# Y103188; the Library will have some reserved copies of the textbooks available. The bulk of the course materials will be available on D2L course site in the course documents section.

We will work on a number of primary literature sources. The links to peer-reviewed articles available through the University of Calgary electronic collection will be provided to all of the students.

7. **Examination Policy:**

No aids are allowed on tests or examinations. Cue-cards will be provided for the examinations, Calculators and open-book allowed during examination. Students should also read the Calendar, [Section G](#), on Examinations.

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8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

All of the submitted materials will be assessed for the coherence and scientific accuracy.

10. Human & Living Organism Studies Statements:

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students taking laboratory- and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with [Section SC.4.1](#) of the University Calendar.

11. Reappraisal Of Grades:

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **15 days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

As per the University of Calgary policies.

12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208).
- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or

expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**

- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).
- Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head, Undergraduate of the Department of Biological Sciences, Heather Addy by email addy@ucalgary.ca or phone 403 220-6979. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.
- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](#) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](#) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](#) Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: suvpaca@ucalgary.ca.
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- l. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

TENTATIVE LECTURE SCHEDULE

We will have Professors J. McCallum (CHEM) and I. Lewis (BCEM) as guest lecturers.

L* stands for lecture, T* denotes tutorials

Lecture	Dates	
L01	Jan-11	Introduction to the Course
L02	Jan-14	Models, Hierarchy of Models and Levels of Approximation
L03	Jan-16	Introduction to biological energy conversion: Mechanical, Electrical and Chemical Equilibrium in Cells
L04	Jan-18	Mechanical and Chemical Equilibrium: Coupling, chemical machines behind
T01	Jan-21	In-class tutorial
L05	Jan-23	Part 2: Cells as minimizers of free energy. (Assignment 1 is posted)
L06	Jan-25	Random world - Distributions in Biological Chemistry. Relevance to Entropy
L07	Jan-28	Entropy, Constraints and Entropy for Protein/DNA Sequences Alignments
T02	Jan-30	In-class tutorial/Journal Club
L08	Feb-1	Boltzmann Distribution
L09	Feb-4	Boltzmann Distribution: Application to Biological Problems (Assignment 1 is due)
T03	Feb-6	In-Class Tutorial
L10	Feb-8	Boltzmann Distribution: Allosteric Systems, Helix-Coil Transition (Assignment 2 is posted)
L11	Feb-11	Introduction to Electrostatics: Living in salty solutions
T04	Feb-13	In-Class Tutorial/Journal Club
L12	Feb-15	Foundation of Biological Structure: Proteins, Equilibrium Theories of Folding (J. McCallum)
L13	Feb-25	Foundation of Biological Structure: Theories of Folding (Assignment 2 is due)
L14	Feb-27	Review for the Midterm
	Mar-1	In-Class Exam
L15	Mar-4	Physical Kinetics: Diffusion, Permeation & Flow (Assignment 3 is due)
L16	Mar-6	Microscopic Dynamics
T05	Mar-8	In-Class Tutorial
L17	Mar-11	Rate Equations and Transition State Theory for Enzymatic Reactions
L18	Mar-13	Rate Equations, Absorption, Binding & Catalysis (Assignment 3 is due)
T06	Mar-15	In-Class Tutorial
L19	Mar-18	Ion channels as example of two-State/three-state systems
L20	Mar-20	The Hodgkin-Huxley Model of the Action Potential: Coupling in Ion Fluxes
T07	Mar-22	In-Class Tutorial or Journal club
L21	Mar-25	Bio and Nano Machines (Assignment 4 is posted)
L22	Mar-27	Models of biological networks
T08	Mar-29	In-Class Tutorial/Journal Club
L23	Apr-1	Models of Biological Networks 2.
L24	Apr-3	Models of biological networks. Metabolomics (L1) (Assignment 4 is due) Ian Lewis, Assignment 5 is posted
L25	Apr-5	Models of biological networks. Metabolomics (L2) Ian Lewis
L26	Apr-8	Final review
		Written Final Examination (As scheduled by the registrar office)

Course Outcomes:

- Evaluate applicability of molecular, cell, tissue and system-level models including Boltzmann distribution, two- and three-state models, entropy maximization analysis in protein sequence alignments
- Select appropriate thermodynamic equations and models to calculate, analyze, and predict the properties and interactions in protein folding and macromolecular assembly formation
- Develop basic understanding of key physical principles used in the analysis of large and noisy data sets in

biochemical experiments, including proteomics, gene-regulatory network mapping and metabolomics as examples

- Understand key models used to describe time-dependent processes in biological systems with special emphasis on biochemical kinetics, rates of biological processes and applications to bioenergetics
- Perform critical review of available scientific literature using biophysical models discussed in the class

Department Approval:

Electronically Approved

Date: 2019-01-08 15:06

Associate Dean's Approval for out of regular class-time activity:

Electronically Approved

Date: 2019-01-08 15:08