

This syllabus is a general representation of the course as previously offered and is subject to change.

BIOL 425 – Biomechanics

General Course Syllabus (as of July 2019)

About the Course:

Course Description: In this course, we take an analytical approach to the study of skeletal mechanics and animal locomotion. We address selected topics in the structure and properties of biological materials, the functional design of muscle and skeletons for locomotion.

Course Format: Lecture and Tutorial

Credits: 3

Prerequisites: BIOL 325

Course Learning Objectives:

By the end of this course, students will be able to:

- Make basic measurements and analyse mechanical behaviour of biological materials.
- Understand material design principles and their application to the analysis of biological structures.
- Design and carry out a small research project, and present results to the class.

Textbooks and Additional Resources:

- No text purchase required
- Vogel (2003) *Comparative Biomechanics* and Gosline (2018) *Mechanical Design of structural materials in Animals* on reserve in Woodward as a reference
- Readings assigned as necessary from journal articles
- You will need regular and reliable access to the Biology 425 Canvas site in order to access required course materials and information (Logon at canvas.ubc.ca using your Campus Wide Login (CWL))

Evaluation:

Note: below is a sample grading scheme for 2019W. The grading scheme may vary by term and instructor.

Assessment	Weight
Lab Reports	25%
Lab Project	20%
Quizzes	20%
Final Exam	35%

Details on Assessments:

Labs:

The class will be split in two groups, each doing labs on alternate weeks. Labs will demonstrate experimental analysis of material properties using biological materials as well as some others where appropriate, and mechanics and kinematic analysis of walking, running and jumping.

Lab project:

The objective of the lab project is to design and carry out an independent project in which a locomotor or physical activity is investigated by kinematic analysis. The approach should be based on the lab exercise on kinematics of human walking and running. Cameras and laptop computers will be available to sign out and use off campus for data collection. The Casio cameras are capable of recording video at high speeds. Video analysis can be carried out using ImageJ and data analysis by Excel. This work should be done in the same groups as for the labs. Results to be presented will include examples of images from the video, as well as the results of the analysis done. Each group should hand in a brief written report, and the last class and lab of the term will be dedicated to the presentation of the project work.

Course Policies:

Quizzes:

There are no make-up quizzes. Students who have missed a quiz and have a valid excuse must email the instructor immediately. If students qualify for a quiz exemption, the grade for the completed quizzes will be re-weighted.

Missed final exam:

Students must email the instructor immediately, then see the Dean's Office in their faculty to determine if they will be allowed to write a deferred final. Students who miss both midterms may not be allowed to write a deferred final.

Note regarding contesting grading on exams:

If students submit their exam for regrading, the entire exam will be remarked and the new grade will be their final grade for that exam, no matter if it goes up or down. Exams are not eligible for regrading if they have been written in pencil, or if the answers appear to have been altered in any way.

Schedule of Topics:

Week	Lecture Topic	Lab
1	Introduction flea jumping	
2	resilin, material design principles slug slime	Gr 1, Lab I beams
3	beam theory byssus	Gr 2, Lab I beams
4	whelk egg capsule, keratin silk	Gr 1, Lab II artery
5	silk/protein rubbers artery wall, elastin	Gr 2, Lab II artery
6	collagen/ tendons muscles	Gr 1, Lab III tendons
7	muscles terrestrial locomotion I: Kinematics	Gr 2, Lab III tendons
8	terrestrial locomotion II Dynamics terrestrial locomotion III Energetics	Gr 1, Lab IV walk/run/hop
9	terrestrial locomotion III Energetics variable muscle function	Gr 2, Lab IV walk/run/hop
10	guest lecture muscle gearing	All student projects
11	insect muscle insect muscle, flight	All student projects
12	hummingbird flight control guest lecture	All student projects
13	whale biomechanics I review	presentation of projects

University Policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.

UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.

UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.

UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).