

MECH 439 - Biomechanical Research Seminar

1 credit, January-April 2020

Fridays, 8-9AM – Blusson Spinal Cord Centre Lecture Hall @ VGH - Main Floor

Instructor Contact Information

Dr. Lyndia Wu
Mechanical Engineering
Office: CEME 2059
lwu@mech.ubc.ca

TA: Loay Al-Salehi
la001989@mail.ubc.ca

Course Purpose

The primary purpose of this course is to introduce you to the research process by connecting you to an authentic community engaging in biomechanical research - namely, graduate students in this field at UBC. By the end of the course, we hope that you will have a strong understanding of how research questions are framed and studied, and that you will be motivated to participate in research yourself in the future.

Class Format

The principal class activity will be attending the weekly seminars of the Mechanical Engineering Department's Biomedical Engineering Research Group.

You will engage in this seminar series mainly by:

- filling our seminar review forms on a weekly basis; in doing this, you will also prepare (and occasionally ask) questions to the presenters
- partnering with a graduate student presenting in the seminars to observe and reflect on how they go about conducting their research

In addition to attending the seminar series, you will conduct literature review on a biomechanical engineering topic that is of interest to you, and complete a literature review report that includes no fewer than 5 papers on the topic. From the review, you should identify gap(s), limitations, or unanswered questions in the research to motivate a study. At the end of the term, you will prepare a short presentation (~5 min) outlining your proposed research study (note: you are NOT expected to actually conduct any research, but the background, motivation, specific research question, and proposed methodology should be discussed).

Specific Learning Objectives

1. You will become familiar with biomedical and biomechanical engineering research that is being conducted at UBC by faculty members and graduate students in the Department of Mechanical Engineering.

2. You will gain an understanding of how research questions are framed, how studies are designed and conducted to address these questions and how the results are assessed to determine the answers to these questions.
3. You will learn how research work is presented to other researchers (e.g., in conference presentations and thesis defenses).
4. You will learn how to conduct literature review on a research topic.
5. You will have an opportunity to investigate an area of personal interest by identifying an open question from your literature review and present a justification for pursuing this (e.g., as is normally done in preparing research proposals).

Prerequisites

None

Textbook

There is no required text for the course.

Seminar Format

The seminar series is scheduled for one hour each week. The seminars simulate conference presentations. Either one PhD student will present a 40-minute overview of their research or two MSc students will each present a 20-minute presentation. Each presentation will be followed by questions from all attendees. Our practice is to first require several questions from students before any faculty members ask questions. You will fill out one seminar review form per session and submit it to the instructor/TA. Be sure to write down at least two questions you would like to ask the presenter, and be sure to ask at least three questions during the term (put an asterisk beside any question on your form that you had an opportunity to ask during the seminar, and briefly summarize the presenter's response).

Graduate Student Mentor Interview Report – Due Date: Jan 31, 2020

You will be matched with a graduate student mentor early in the term. Once matched, you should interview your graduate student mentor and produce a brief summary (1.5-2 pages) of their thesis research, as well as their tips/advice on research, in your own words. The template for this interview report will be provided to you. The goal is to get a better understanding of the research process, as well as get some tips for later pursuing your own research projects. Take this opportunity to ask any additional question you may have about research.

Critical Paper Review Report - Due Date: March 15, 2020

In this individual assignment, you have an opportunity to pursue an area of personal interest. You should start thinking about a biomechanics research topic that is of interest to you from the beginning of the course. You should identify a topic/question and a set of at least 5 recent research papers (within past 5 years) to review in-depth on this topic. The topic and list of papers should be sent to the instructor for approval by **Feb. 14**. The best source for finding biomedical research papers is the PubMed database (available

free; many e-links to the full papers are available via the UBC Library system). You will then read these papers and produce a short literature review report (with suggested sections of Background and Motivation, Summary of Current Findings, Key Gaps and Limitations). Start by carefully reading the introductions of these papers to understand how they justify the need to conduct the study reported in the paper. Pay special attention to how they discuss the importance of the larger problem and how they analyze the previous work to identify gaps in our knowledge. You should also synthesize the findings from these papers and discuss key areas of limitations. Your goal is to identify a still-unsolved problem related to these papers. The final report (1000-1250 words, excluding references) is due on **March 15**. Be careful not to directly copy any content from the papers you're reviewing into the literature review report – this would be considered plagiarism. Summarize everything in your own words.

Research Proposal Presentation - Due Date: early April, 2020, date TBD

Following your literature review report, with the limitations and gaps in mind, prepare a short (5 or 6 slides) PowerPoint or Keynote presentation to outline your own research proposal. Note that you do not have to conduct the research. Your presentation should have at least the following four components to it:

- A 'hook' - ie, a brief and succinct description of the problem that motivates the study
- A 'what is currently known' section - this describes what we currently know about the problem and what the current approaches are, highlighting their strengths and limitations
- A 'what we don't know' section - this focuses our attention on the limitations of previous studies and the gaps in our knowledge
- The research question itself - if you've done your job correctly, you should be able to say, "therefore, it is necessary that we study the following specific question: ...".
- A brief description of your proposed methodology (how you might go about addressing the question, e.g. what kind of study will you do? What data will you collect?)

You will present your research proposal in front of your classmates and some graduate students/professors. We recommend that you discuss a draft of your proposal presentation with the instructor or with your graduate student partner (if they're willing) or other graduate student friends by about **March 25th** in order to give yourself enough time to revise your presentation before the seminar date.

Course Grading

- | | |
|--|-----|
| • Attendance, quality of reviews, questions: | 30% |
| • Graduate student mentor interview report (~1.5-2 pages): | 10% |
| • Literature review report (~ 3-4 pages): | 30% |
| • Research proposal presentation (~5 min): | 30% |

Key Dates

- ~January 10 - matched with graduate student partner
- January 31 – submit interview report
- February 14 – submit research topic and list of papers to instructor for approval
- March 15 – Literature review paper due
- ~March 25 - discuss draft presentation with instructor or grad student partner
- Early April - presentation date