

Course number	U-LAS70 10002 SE50				
Course title (and course title in English)	ILAS Seminar-E2 :Discussions in Biomechanics and Biophysics (バイオメカニクス・生物物理セミナー) ILAS Seminar-E2 :Discussions in Biomechanics and Biophysics	Instructor's name, job title, and department of affiliation	Institute for Life and Medical Sciences Assistant Professor, KIM, Young Kwan		
Group	Seminars in Liberal Arts and Sciences	Number of credits	2	Number of weekly time blocks	1
Class style	seminar (Face-to-face course)	Year/semesters	2024・Second semester	Quota (Freshman)	12 (12)
Target year	Mainly 1st year students	Eligible students	For all majors	Days and periods	Wed.5
Classroom	04, Yoshida-South Campus Bldg. No. 1			Language of instruction	English
Keyword	Biology / Physics / Biomedical / Engineering				
[Overview and purpose of the course]					
<p>May force be with you. This famous goodbye phrase from Star Wars summarises the important roles physical forces like gravity, friction etc play in our daily life. It turns out that living systems including our bones, muscles, cells and even proteins in our body depend a lot on physical forces to function properly. For example, why do astronauts become weak such that they are unable to walk after prolonged stay in space? Or, how do plants utilize photons of light to make glucose? Again, why are migratory birds able to sense their migration direction over long distances? These are just but a few examples highlighting how living systems on earth have adapted to physical forces such as gravity and electromagnetic forces, etc. In this seminar, we will discuss some of the ground breaking discoveries and technological advances integrating biology, physics, and chemistry. Specifically, we will explore how living systems, including the human body, have adapted to and utilize physical forces to survive and function normally, and sometimes, abnormally.</p>					
[Course objectives]					
The ultimate goal of this seminar is to help students nurture a multidisciplinary approach to scientific discussions and problem solving in biology, medicine and engineering.					
[Course schedule and contents]					
Discussions in this seminar will center on the impact of physical forces on living systems, and adaptive responses of such systems to acting forces. Some selected discussion topics are listed below.					
<p>1) Recent exciting discoveries in science with revolutionary societal impacts (3 weeks) We will begin the discussion series by exploring ground-breaking discoveries in biology, chemistry, physics and/or engineering, and discuss their impacts on the society. Topics may be drawn from Nobel Prize winning researches which are expected to contribute significantly to advances in biology, medicine and/or engineering.</p> <p>2) Connecting the dots: Exploring interconnectivity between physics and biology (3 weeks) Discussions here will explore interesting but rather puzzling phenomena involving the interaction between physical forces and living systems. We will discuss how living systems (including our body) sense and react to physical forces in the environment. Specific examples of adaptations to forces in biology will be drawn</p>					
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from plants, animals, and even from the human body. Importantly, the importance of force-mediated adaptation in health and disease will be explored.

3) May force be with you: Life in a force-ruled world (3 weeks)

Some forces like friction may sometimes be annoying, but equally important in our daily life. Our body itself is a force producing machine; our muscles contract, our hearts beat, our lungs expand and shrink, blood flow through our veins and arteries etc. This topic will explore how our bodies adapt and respond to forces at the cellular level, and how this is important to biology and medicine.

4) Role of forces in bone and muscle health (3 weeks)

Why do astronauts lose their ability to walk after staying in space for an extended period of time? Continuing the theme of the previous topic, this topic will look specifically into the role of physical forces in bones and muscles, including why lack of physical exercise or prolonged exposure to microgravity conditions may contribute to the weakening of muscles and bones.

5) Role of forces in wound healing and disease development (2 weeks)

This topic will introduce latest pioneering researches on the role of physical forces in wound healing and disease development, and how physical forces can be exploited to realize better treatment methods and improve quality of life.

6) Lecture review and student presentations (2 weeks)

[Course requirements]

None

[Evaluation methods and policy]

Class attendance and active participation: 60%

Discussions and presentations: 40%

[Textbooks]

Not used

[References, etc.]

(**References, etc.**)

Introduced during class

[Study outside of class (preparation and review)]

You may consider listening to TED talks to learn about some exciting science topics and how to give a nice presentation.

[Other information (office hours, etc.)]

Office hours will be announced during class hours.