| Course number | U-LAS14 20068 LE68 | | |
|---|---|---|---|
| Course title (and course title in English) | Proteins-workforce of life-E2<br>Proteins-workforce of life-E2 | Instructor's name, job title, and department of affiliation | Graduate School of Agriculture<br>Associate Professor,YASIR SERAG ALNOR MOHAMMED SERAG ALNOR |

| Group | Natural Sciences | Field(Classification) | Biology(Issues) |
|---|---|---|---|

| Language of instruction | English | Old group | Group B | Number of credits | 2 |
|---|---|---|---|---|---|

| Number of weekly time blocks | 1 | Class style | Lecture<br>(Face-to-face course) | Year/semesters | 2026・First semester |
|---|---|---|---|---|---|

| Days and periods | Wed.3 | Target year | Mainly 1st & 2nd year students | Eligible students | For science students |
|---|---|---|---|---|---|

## [Overview and purpose of the course]

Purpose
This course will introduce the wonderful world of proteins. Proteins are a type of organic macromolecule that are fundamental building blocks of life. While we hear a lot about proteins in daily life, in ads for protein shakes and protein powders, there are a few misconceptions about why proteins are essential and how they work. The many proteins manufactured by cells perform a broad range of essential functions; they are the molecular workforce of living organisms. Proteins catalyze metabolic reactions, replicate DNA, respond to stimuli, provide movement, and much more. Here, we will explore how proteins are constructed and fold into three-dimensional shapes, the kinds of bonds that hold these folded structures together, and the immense range of proteins' roles in our life. We will also explore how proteins are purified and characterized in order to understand their structure and function.

## [Course objectives]

1. Gain a deeper understanding of proteins and structural biology.
2. Appreciate the important range of roles the proteins perform in our life.
3. Be familiar with the tools for studying, characterizing, and determining the 3D structure of proteins.

## [Course schedule and contents)]

The following topics will be covered during the 14 weeks of the semester. Week 15 is an exam session, and a feedback class is given at week 16.

Main topics
1. Review of basic cell biology
2. Introduction to proteins and amino acids and their vital role in the cell
3. Levels of protein structure and forces that hold proteins into their three-dimensional functional form
4. Protein synthesis in the cell and its post-translational modifications
5. Protein translocation, sorting into different organelles and degradation
6. Proteins as catalysts for cellular processes
7. Nature of proteins embedded in cell membranes and their role in signal transduction
8. Role of proteins in innate and adaptive immune response
9. DNA cloning, recombinant expression and mass production of proteins
10. Purification and overview of techniques for analyzing proteins
11. Selected methods for characterizing proteins and their function
12. Protein design and engineering

Continue to Proteins-workforce of life-E2(2)↓↓↓

**Proteins-workforce of life-E2(2)**

13. Tools in determining protein three-dimensional structure
14. Proteome analysis and its significance

**[Course requirements]**

English proficiency sufficient for understanding lectures, reading articles and texts, and participating in class discussions. A knowledge of high school biology and chemistry is also required.

**[Evaluation methods and policy]**

Grading: Class attendance and active participation (20%), assignment and quizzes (30%), and final exam or coursework (50%).

**[Textbooks]**

Not fixed
Introduced during class

**[References, etc.]**

**（References, etc.）**

Introduced during class
Handouts and supplemental readings will be distributed electronically and/or as a hard copy in class

**[Study outside of class (preparation and review)]**

Students should read or listen to the required pre-class materials and submit any required assignment before the class, and come to class ready to participate in class activities.

**[Other information (office hours, etc.)]**

No fixed office hours. Students are requested to make appointments directly or by email.

**[Essential courses]**