**Syllabus of Molecular Biology**

1. **Course Name:**

Molecular Biology (Full-English Course)

1. **Course Number:**

S19210

1. **Periods and Credits:**

48 class hours, 3 credits

1. **Object-oriented Requirements:**

Foreign students and Chinese students with a certain level of English ability who are majoring Biology, Biological and Medical Engineering or Pharmaceutical Sciences.

1. **Pre-requisite:**

None

1. **Textbook:**

《Molecular Biology of The Cell》6th Edition，Bruce Alberts *et al.*，Garland Science (2014)，ISBN：0815344325

1. **Other References:**
2. Molecular Biology of The Cell Sixth Edition The Problems Book, John Wilson and Tim Hunt *et al.*，Garland Science，2014，ISBN：0815344538
3. Lewin’s Genes XI, Jocelyn E. Krebs *et al*.，Jones and Bartlett Publishers，2014，ISBN：1449659853
4. Essential Cell Biology, Bruce Alberts *et al.*，Garland Publishing，2013，ISBN：0853696470
5. Cellular and Molecular Immunology, 8e，Abul K. Abbas, MBBS *et al.*，Saunders，2014，ISBN：0323222757
6. Molecular Biology of The Gene, James D. Watson *et al.*，Pearson，2013，ISBN：0321896564
7. **Course Description:**

Molecular Biology is one of the basic sciences in the Life Sciences; it is related with the proteins, ribonucleic acids and other biological macromolecules, their interaction, and also their interaction with their environment. This knowledge is basic knowledge for Biomedical engineering, Cellular Biology, Genetics, Developmental Biology, Genetic Engineering, Pharmacology and others.

This course is a full-English teaching course, and we will use English textbook. This course aims to help foreign students, so that they could learn the basic and frontier knowledge in Molecular Biology without any language barrier. At the same time, the lack of professional and scientific English skill, especially in the field of Biological and Medical Sciences, is an obstacle for Chinese students for accessing frontier researches, which are majorly published in English. Thus, this course also aims to provide a chance for Chinese students to directly study Molecular Biology in English, to strengthen their basic and frontier knowledge in this field; and also to strengthen their professional and scientific communication skill in English.

**Contents:**

**Lectures (24 class hours + 2 class hours for examination)**

**Part I-Introduction to The Cell (3 class hours)**

Understanding cells, genome, gene, Central Dogma, heterogeneity of organism and genes, genetic information of eukaryotes, biochemistry, basic bioenergetics, chemical reactions in the organism, protein structure and function and functional regulatory system.

**Part II-Basic Genetic Mechanisms (4 class hours)**

Understanding DNA, chromosome and genome, learn about the mechanism of DNA replication, repair and recombination, learn about the mechanism of how the cells use genetic information and the regulation of gene expressions.

**Part III-Isolating Cells and Growing Them in Culture (1 class hour)**

Introducing students the basic skills of culturing and isolating cells, purifying and analyzing protein structures and functions, analyzing and manipulating DNA expression, analyzing gene expression levels and gene functions, analyzing cell functions and for visualizing cells.

**Part IV-Internal Organization of The Cell (10 class hours)**

Understanding cell membrane and its functions, mitochondria and chloroplast and energy conversion, learn about cell signaling, cytoskeleton, cell cycle, apoptosis, and cell junctions and the extracellular matrix.

**Part V-Cells in Their Social Context (4 class hours)**

Understanding tumorigenesis mechanism, development of multicellular organisms, stem cells and tissue renewal, and immune system.

**Two special topics**

**Discussion (14 class hours)**

Introduce and discuss about related topics and/or research article.

**Reading (8 class hours)**

Read related research article and make reports.

1. **Aims of the course**

**Knowledge:**

As one of the most basic research area of modern life science, molecular biology is the key to understand cell, organism and even life. Through this course, the students will learn about the points below:

1. Learn about molecules that composed the cells, including ribonucleic acids, proteins, lipids and even organic and non-organic molecules, and their biological functions.
2. Learn about the interaction between molecules, the signaling pathways they regulate, and the complexity of cell and organism.
3. Learn about the roles of molecular signaling pathways in regulating cell proliferation, differentiation, migration, metabolism, immune system, and other biological functions; and about their correlation with cell and organism.
4. Learn about the correlation between the abnormal molecular mechanism and diseases including cancer, metabolic syndrome, congenital disease, immune disease and cardiovascular disease.
5. Understand and link up the relation between molecular biology, biomedical engineering, pharmacology, developmental biology, plant cells and other related fields.

**Ability:**

Through Molecular Biology (full-English course), students will learn about the basic and the theory of Molecular Biology, and will be able to understand the physiological phenomena in the cells and organism. Through reading research articles and discussing related topics, students will understand the use of Molecular Biology knowledge in frontier research, strengthen searching and reading papers ability, thinking ability, logic, analyzing and expressing abilities， which are closely related with the ability of performing research. This course will also help student understanding professional and scientific English, and increasing their ability to communicate in English, especially in the field of Molecular Biology.

**Quality:**

While learning Molecular Biology, students will also learn to integrate what they learn with other related fields, such as Cellular Biology, Biochemistry, Genetics, Developmental Biology, Immunology, Biomedical Engineering, and Botany. We also introduce frontier researches and hot topics in Molecular Biology, and have plentiful discussion sessions. These help students to strengthen their logic, so that they could analyze scientific problems objectively and critically.

1. **Teaching Methods**

The course includes lecture, discussion and reading sessions.

1. **Assessment**

The assessment will be based on the student’s attendance, participation in the class，assignment and final exam. Attendance and participation in the class weight 30% of the total score, while assignment weight 30% and final exam (open-book examination) weight 40% of the total score.

1. **Schedule**
2. 1st meeting: Part I (Introduction) 2 class hours
3. 2nd meeting: Part I (Introduction) 1 class hour, Part II (Genetic Mechanisms) 1 class hours.
4. 3rd meeting: Part II (Genetic Mechanisms) 2 class hours
5. 4th meeting: Part II (Genetic Mechanisms) 1 class hour, Part III (Isolating Cells and Growing Them in Culture) 1 class hour
6. 5th meeting: Reading 4 class hours
7. 6th -10th meetings: Part IV (Internal Organization of The Cell) 10 class hours (2 class hours / meeting)
8. 11th meeting: Reading 4 class hours
9. 12th -13th meetings: Part V (Cells in Their Social Context) 4 class hours (2 class hours / meeting)
10. 14th meetings: Special topics 2 class hours
11. 15th -18th meetings: Discussion 14 class hours (4 class hours / meeting for 3 meetings, 2 class hours / meeting for 1 meeting)
12. 19th meeting: Final exam 2 class hours