全英语课程采用如下英文版教学大纲

Syllabus

Department: **School of Life Sciences**   **Date:** **February 17, 2024**

Course Code	BIOL130093.01					
Course Title	Biological Thermodynamics					
Credit	2	**Experiment (including Computer) Credit**	0	**Practice Credit**	0	**Aesthetic Education Credit** 0
Credit Hours Per Week	2	**Education on The Hard-Working Spirit Credit Hours**	0	**Language of Instruction** English	**Honors Course**	□Yes ☑No
Course Nature	□Core General Education Course □Specific General Education Course □Basic Course in General Discipline □Others		2+X Major： □Professional Core Course ☑Professional Advanced Course			
			Non 2+X Major： □Professional Compulsory Course □Professional Elective Course			
Course Objectives	Thermodynamic principles are widely applied in biological research work, especially in studying the structures and functions of biomolecules. The aim of this course is to help students understand the basic thermodynamic principles and apply these principles in biological research work, e.g., in the field of drug design.					
Course Description	Course lectures include the introductions of the basic concepts of thermodynamics and their applications in biology. These concepts include the First Law and the Second Law of Thermodynamics, and the related principles including chemical equilibria, phase equilibria, binding equilibria, etc. In addition, the basic concepts of kinetics will be introduced along with their applications in biology. Towards the end of the course, there is a brief introduction of computational drug design with the examples utilizing the principles of thermodynamics and kinetics. The course is designed to help students understand basic principles of thermodynamics and kinetics and apply them in biological research work.					

Course Requirements: None.

Teaching Methods: All lectures will be given in English.

Course Director's Academic Background:

The instructor works in the fields of biophysics, computational biology, and thermodynamics.

Instructor's Academic Background: Same as above.

Members of Teaching Team				
Name	**Gender**	**Professional Title**	**Department**	**Responsibility**
Di Wu	Female	Associate Researcher	School of Life Sciences	Instructor

Course Schedule (Please supply the details about each lesson)**:**

(Please note that some of the following lectures may be joined together in case of the holiday break.)

Lecture 1: Introduction

Lecture 2: Introduction of the Laws of Thermodynamics Using Biological Examples

Lecture 3: Heat, Work, Energy, and Biofuels

Lecture 4: Enthalpy, Heat Capacity, and Their applications in Biology

Lecture 5: Entropy, and Its Applications in Biology

Lecture 6: The Second Law of Thermodynamics, and Its Applications in Biology

Lecture 7: Free Energy, and Its Applications in Biology

Lecture 8: Chemical Equilibria

Lecture 9: Phase Equilibria

Lecture 10: Solutions and Mixtures

Lecture 11: Stability of Protein Structures

Lecture 12: Introduction to Kinetics

Lecture 13: Applications of Kinetics in Biology

Lecture 14: Ligand Binding

Lecture 15: Thermodynamics and Kinetics of Drug Binding and a Brief Introduction to Computational Drug Design
Lecture 16: Presentations by the Students

The design of class discussion or exercise, practice, experience and so on: NA

If you need a TA, please indicate the assignment of assistant: NA

Grading & Evaluation (Provide a final grade that reflects the formative evaluation process)**:**
- Homework: 20%
- Attendance and Participation: 20%
- Project Presentation: 25%
- Project Paper: 35%

Usage of Textbook：☐Yes(complete textbook information form below)　☑No

Textbook Information (No more than two textbooks) **:**

Title	Author	ISBN	Publishing time	Publisher	Type	Type
					☐Self-compiled Textbook (Published) ☐Non-mainland Textbook ☐Other Textbook (Published)	☐National Planning Textbook ☐Provincial and Ministerial Planning Textbook ☐School Level Planning Textbook ☐Others
					☐Self-compiled Textbook (Published) ☐Non-mainland Textbook ☐Other Textbook (Published)	☐National Planning Textbook ☐Provincial and Ministerial Planning Textbook ☐School Level Planning Textbook ☐Others

Teaching References (Including author, title, publisher, publishing time, ISBN)**:**
- Donald T. Haynie, Biological Thermodynamics, Cambridge University Press, 2001. (ISBN: 9780521884464).
- Ken A. Dill & Sarina Bromberg, Molecular Driving Forces: Statistical Thermodynamics in Chemistry and Biology, Garland Science, 2003. (ISBN: 9780815320517).
- Gordon G. Hammes, Thermodynamics and Kinetics for the Biological Sciences, John Wiley & Sons, 2000. (ISBN: 0471374911).

Table column size can be adjusted according to the content.