



蘇州大學
Soochow University

BIO 271 Biological Systems and Energy Flow

Winter 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

This course is designed to provide a comprehensive understanding of the fundamental principles governing the flow of energy within living organisms and ecosystems. Throughout the course, students delve into various topics related to energy acquisition, storage, utilization, and transfer, gaining a deep understanding of the intricate processes that sustain life.

Upon Completion of this Course, students will be able to:

1. Understand and apply the laws of thermodynamics to biological processes, emphasizing the concepts of energy transfer, entropy, and spontaneity
2. Explore the role of cell membranes in maintaining cellular integrity and regulating the passage of molecules involved in energy transformations
3. Understand the ecological principles governing energy budgets and allocation strategies in diverse environmental conditions
4. Investigate the enzymatic reactions and regulatory mechanisms involved in energy flow within cells
5. Plan and execute experiments, considering experimental design, data collection methods, and ethical considerations
6. Critically evaluate the impact of human activities on energy flow in biological systems and propose informed solutions

PREREQUISITES



BIO 222 Biological Systems Thinking

GRADING

Grades will be determined by accumulating points, with 100 points being the maximum, as follows:

ITEM	POINTS
Participation	10 Points
Quizzes	20 Points
Midterm	20 Points
Laboratory Reports	20 Points
Final Exam	30 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F.$$

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

Morris et al. 2016. *Biology: How Life Works*, 2nd edition. WH Freeman and Company.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
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Module 1	<p>Topics: Topic 1: Introduction to the fundamental role of energy in living systems Topic 2: Overview of different forms of energy (kinetic, potential, chemical) Topic 3: Application of the first and second laws of thermodynamics to biological processes Topic 4: Energy transfer and entropy in biological systems</p> <p>Assessments: Quiz#1</p>
Module 2	<p>Topics: Topic 5: Overview of cellular processes related to energy flow Topic 6: Introduction to ATP as the primary energy currency in cells Topic 7: Detailed study of glycolysis and its role in glucose metabolism Topic 8: Overview of the Krebs cycle and oxidative phosphorylation</p> <p>Assessments: Lab Report#1</p>
Module 3	<p>Topics: Topic 9: Exploration of cell membrane structure Topic 10: Role of membranes in maintaining cellular integrity Topic 11: Overview of different modes of membrane transport Topic 12: Role of energy in active transport processes</p> <p>Assessments: Midterm</p>
Module 4	<p>Topics: Topic 13: Overview of Metabolic Pathways Topic 14: Enzymes and Regulation Topic 15: Energy Allocation in Organisms Topic 16: Metabolic Adaptations to Environment</p> <p>Assessments: Quiz#2 Lab Report#2</p>
Module 5	<p>Topics: Topic 17: Trophic Interactions Topic 18: Nutrient Cycling Topic 19: Anthropogenic Influences on Ecosystems Topic 20: Research Methods in Energy Biology</p> <p>Assessments: Final Exam</p>

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to



decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

LEARNING REQUIREMENTS

- 1) Late assignments are not acceptable and are subjected to grade deductions.
- 2) Assignments submitted in the wrong format will be counted as not submitted.
- 3) Failure to submit or fulfill any required course component results in failure of the class.
- 4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
- 5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

ACADEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the



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academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.