Chemistry 6760, Spring 2021
Principles of Bioenergetics
Utah State University
1 credit
Meeting location and times: TBA
Prof. Lance C. Seefeldt, W241, 797-3964, lance.seefeldt@usu.edu

Office Hours:
By appointment.

Goals:
This course is part of the core graduate level biochemistry courses offered at USU. This section will focus on an in-depth analysis of the principles of energy transformations in living systems. This will include coverage of energy requirements for living systems, thermodynamics relevant to biochemistry, core energy pathways (e.g., substrate level and oxidative phosphorylation, photosynthesis, etc.), and the diversity of fueling reactions found in living organisms. Students will gain in-depth knowledge from specialty text books, current reviews, and primary literature on these topics.

Meetings
The lectures will be delivered as videos posted in Canvas. We will also have weekly live Zoom meetings.

Text:
A current biochemistry text book such as Lehninger Principles of Biochemistry, by Nelson and Cox is recommended as background reading. Content beyond the textbook level will be drawn from a variety of specialty books, current review articles, and the primary literature. Materials for the course, including literature, will be available on the course Canvas page.

Prerequisites:
A full year of undergraduate organic chemistry; a full year of undergraduate biochemistry (comparable to CHEM 5700-5710 at USU), with physical chemistry recommended.

Online Info:
Classroom handouts, class standings, exam keys, etc. will be available on the course Canvas page at canvas.usu.edu. Username = banner ID; password = banner pin.

Exams:
There will be two examinations worth 150 points each during the course. Missed exams will be scored as a zero. Make-up exams are possible only for excused absences by appointment. Exams are open book/notes. Connection to the internet is not allowed during the exams. You should not consult other people during the exam. Exams will be provided on Canvas over a few days. Exams should be written on plain white paper, scanned as a single PDF document (recommend TurboScan on your phone or tablet), and uploaded into Canvas before the closing time.

Grading:
Grading is based on the points earned on the exams. The final letter grade will be determined by comparing the total points earned to the total points possible. Grading will be curved with consideration of the performance of the entire class and previous classes.

Two exams @ 150 points each................................................................. 300 points
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Total

300 points

Assessment:
Assessment of the course will include the University online IDEA evaluation conducted at the end of the course. Information from the evaluation will be used to improve the course.

Provisions: This course will adhere to the USU Academic Policies and Procedures Manual found at the web site http://www.usu.edu/policies/ and in the student code http://www.usu.edu/studentservices/studentcode/. Any student with a disability who requires accommodation must contact the instructor. The disability must be documented by the Disability Resource Center. Course materials may be requested in alternative formats.
Outline of Topics

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<thead>
<tr>
<th>Lecture Module</th>
<th>Title</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>Management of Energy in Living Systems</td>
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<tr>
<td>2</td>
<td>Bioenergetics</td>
<td>Core concepts of Thermodynamics</td>
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<td>Laws of Thermodynamics</td>
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<td>Equilibrium and Free Energy</td>
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<td>Electrochemistry and Electron Transfer</td>
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<td>3</td>
<td>Core Metabolism</td>
<td>3A Glycolysis</td>
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<td>3B TCA</td>
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<td>3C Fats and Proteins</td>
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<td>3D OxPhosph</td>
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<td>3E Photosynthesis</td>
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<tr>
<td>4</td>
<td>Other metabolism</td>
<td>Methanogenesis, chemolithotrophy</td>
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Calendar, Spring 2021

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<tr>
<th>Week of</th>
<th>Zoom meeting day/time</th>
<th>Topic</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1/19</td>
<td>1/19; 11:30 am</td>
<td>Modules 1-2</td>
<td>modules 1 and part of 2 videos, read paper by Rich Nature</td>
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<td>1/21; 11:30 am</td>
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<tr>
<td>1/25</td>
<td>1/28; 11:30 am</td>
<td>Module 2-3A, B</td>
<td>modules 2 and part of 3 videos, read paper Westheimer</td>
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<td>2/1</td>
<td>2/4; 11:30 am</td>
<td>Module 3C,D,E</td>
<td>module 3 videos, read papers Mitchell; Sambongi, Exam 1 (mod 1,2,3A-B)</td>
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<tr>
<td>2/8</td>
<td>2/11; 11:30 am</td>
<td>Module 4</td>
<td>module 4, read paper Klump</td>
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<tr>
<td>2/15</td>
<td>No meeting</td>
<td></td>
<td>Exam 2 (mod 3C,D,E, 4)</td>
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**Zoom meeting information:** (room coordinates are in Canvas)

Week 1: Organizational meeting: cover syllabus, format, exams, etc. 1/19; 11:30 am
Week 1: Review, questions, discuss paper; 1/21; 11:30 am
Week 2: Review, questions, discuss paper; 1/28; 11:30 am
Week 3: Review, questions, discuss papers; 2/4; 11:30 am
Week 4: Review, questions, discuss paper; 2/11; 11:30 am

**Time breakdown:**
Video lectures 320 min
Zoom meetings 180 min
Exams 180 min
Total 680 min
Additional Information:

Academic Freedom and Professional Responsibilities

Academic freedom is the right to teach, study, discuss, investigate, discover, create, and publish freely. Academic freedom protects the rights of faculty members in teaching and of students in learning. Freedom in research is fundamental to the advancement of truth. Faculty members are entitled to full freedom in teaching, research, and creative activities, subject to the limitations imposed by professional responsibility. USU Policy 403 further defines academic freedom and professional responsibilities.

Academic Integrity - "The Honor System"

The University expects that students and faculty alike maintain the highest standards of academic honesty. The Code of Policies and Procedures for Students at Utah State University (Student Conduct) addresses academic integrity and honesty and notes the following:

Academic Integrity: Students have a responsibility to promote academic integrity at the University by not participating in or facilitating others' participation in any act of academic dishonesty and by reporting all violations or suspected violations of the Academic Integrity Standard to their instructors.

The Honor Pledge: To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity". Violations of the Academic Integrity Standard (academic violations) include, but are not limited to cheating, falsification, and plagiarism

Plagiarism

Plagiarism includes knowingly "representing by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

Grievance Process

Students who feel they have been unfairly treated in matters other than discipline, admission, residency, employment, traffic, and parking - which are addressed by procedures separate and independent from the Student Code] may file a grievance through the channels and procedures described in the Student Code: Article VII Grievances

Sexual Harassment

Utah State University is committed to creating and maintaining an environment free from acts of sexual misconduct and discrimination and to fostering respect and dignity for all members of the USU community. Title IX and USU Policy 339 address sexual harassment in the workplace and academic setting.

The university responds promptly upon learning of any form of possible discrimination or sexual misconduct. Any individual may contact USU's Affirmative Action/Equal Opportunity (AA/EO) Office for available options and resources or clarification. The university has established a complaint procedure to handle all types of discrimination complaints, including sexual harassment (USU Policy 305), and has designated the AA/EO Director/Title IX Coordinator as the official responsible for receiving and investigating complaints of sexual harassment.

Students with Disabilities

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early
in the semester as possible (University Inn # 101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Withdrawal Policy, "I" Grade Policy and Dropping Courses

If a student does not attend a class during the first week of the term or by the second class meeting, whichever comes first, the instructor may submit a request to have the student dropped from the course. (This does not remove responsibility from the student to drop courses which they do not plan to attend.) Students who are dropped from courses will be notified by the Registrar’s Office through their preferred e-mail account.

Students may drop courses without notation on the permanent record through the first 20 percent of the class. If a student drops a course following the first 20 percent of the class, a W will be permanently affixed to the student’s record (check General Catalog for exact dates).

Students with extenuating circumstances should refer to the policy regarding Complete Withdrawal from the University and the Incomplete (I) Grade policy in the General Catalog.

No-Test Days Policy

For classes that meet for a full semester, a five-day period designated as "no-test" days precedes final examinations. During this time, no major examinations, including final examinations will be given in order that students may concentrate on classwork, the completion of special assignments, writing projects, and other preparation for duly scheduled final examinations. Approved exceptions include final papers, weekly chapter quizzes, quizzes, projects, and examinations associated with a lab that does not meet during final examinations. This policy does not apply to classes that meet only during the second 7-week session of the semester or to classes offered during the summer term. Complete information related to Final Examination Policies can be reviewed in the General Catalog.

Assumption of Risk

All classes, programs, and extracurricular activities within the University involve some risk, and some involve travel. The University provides opportunities to participate in these programs on a voluntary basis. Therefore, students should not participate in them if they do not care to assume the risks. Students can ask the respective program leaders/sponsors about the possible risks a program may generate, and if students are not willing to assume the risks, they should not select that program. By voluntarily participating in classes, programs, and extracurricular activities, students do so at their own risk. General information about University Risk Management policies, insurance coverage, vehicle use policies, and risk management forms can be found at http://www.usu.edu/riskmgmt/.

Mental Health

Mental health is critically important for the success of USU students. As a student, you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. Utah State University provides free services for students to assist them with addressing these and other concerns. You can learn more about the broad range of confidential mental health services available on campus at Counseling and Psychological Services (CAPS).

Students are also encouraged to download the “SafeUT App” to their smartphones. The SafeUT application is a 24/7 statewide crisis text and tip service that provides real-time crisis intervention to students through texting and a confidential tip program that can help anyone with emotional crises, bullying, relationship problems, mental health, or suicide related issues.