Course Information-Biochemistry II-Intermediary Metabolism (BB491/591)

Course Name: Biochemistry II-Intermediary Metabolism  
Course number: BB491/591  
Course location: Held as a hybrid class online where lectures will be narrated videos which can be found on the Canvas class webpage; in-person study sessions to embellish the lectures will be held M, W, and F from 10-10:50 am @ Withycombe 109.

Instructor: Tory Hagen Ph.D., 335 Linus Pauling Science Ctr (LPSC)

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Teaching Assistant: Rachel Franklin; franklra@oregonstate.edu

Office hours: Office hours will be scheduled immediately following the in-person study session (~11:00 am until noon @ Dr. Hagen’s office [see above; my office is on the 3rd floor of LPSC across the street from Withycombe 109]) Wednesdays and Fridays; TA office hours will be Tuesdays and Thursdays (noon-12:50 on Tues; 10-10:50 am on Thurs) in LPSC 302.

Additional meetings may be scheduled in advance with either Dr. Hagen and Ms Franklin.

Both Dr. Hagen and Rachel Franklin can also be reached by email (see above), and if preferable, phone conversations can be conducted.

Course description: This course will focus on enzymes are arrayed as biochemical pathways and grouped into performing work in “metabolic blocks”: catabolic pathways that that oxidize (i.e. catabolize) fuel molecules (carbohydrates, lipids and amino acids) to provide metabolic energy, ATP, and/or reducing power, NADPH; photosynthetic pathways that autotrophs use to transduce light energy; and, anabolic pathways that use metabolic energy and reducing power to synthesize necessary biomolecules for living organisms to thrive. We will also discuss how these metabolic blocks are integrated. Finally, we will consider how several human diseases arise from defects in metabolic pathways.

Course Objectives:
- Understand the metabolism of carbohydrates, lipids, and protein
- Understand the inter-relationships of anabolic and catabolic enzyme-catalyzed biochemical pathways, and the regulatory mechanisms associated with these pathways
- Understand how latent chemical energy in the form of macronutrients can be transformed into metabolic energy

Course credits: As indicated above, BB 491/591 will be presented as a flipped classroom where lectures will be audio narrated and made available via Canvas. The class will also meet ‘live’ at the indicated times. If changes in incidence of the coronavirus warrant, we may have to move to a fully online course. If so, the scheduled in-person meeting period will change to a zoom class but still be “live” 3 times/week (M, W, F starting at 10 am). Regardless of how the meetings are presented, the 50 minute study period will be used to go over key points of the lectures, answer questions related to the narrated lecture, and also used at times to present problems to aid in comprehension of the material. Overall, the course combines approximately 90 hours of instruction, and student assignments (for BB591) for a total of 3 credits.
Course Prerequisites and Co-requisites: This is a sequence professional course to meet the requirements of majors in biochemistry and biophysics. It must be taken in order. PREREQUISITES: CH 336; BB 317 (cell and molecular biology), and BB 490. COREQUISITES: CH 440; CH 441; CH 442.

Course Content: Metabolism of carbohydrates, lipids, and amino acids; biological oxidation, oxidative phosphorylation, photosynthesis; integration of metabolism.

Course Specific Measurable Student Learning Outcomes:

Learner Outcomes for BB491
- Understand the fundamental nature of mitochondrial bioenergetics
- Learn how fuel molecules are broken down (catabolized) and how some of the released energy is conserved in the form of high energy phosphoanhydride bonds (ATP), and NADPH
- Learn how the building blocks of polysaccharides, lipids, proteins and nucleic acids are synthesized from simpler precursors using energy from ATP hydrolysis
- Acquire a working knowledge of biochemistry related to intermediary metabolism
- Gain an understanding of how metabolic pathways are regulated
- Understand cellular signaling pathways and the biochemistry of hormone action
- Display an understanding of key concepts relevant to intermediary metabolism via performance on written examinations

Learner Outcomes for BB591
- In addition to the above, graduate students (BB591) must to be able to use critical thinking to resolve and discuss contemporary research question. For this, students will work together on a research topic to produce a comprehensive review of the literature related to the topic and present this information to the class. In addition, some questions on the midterm exams and final will be designed for them that test the ability to synthesize information and apply it to the question at-hand.

Learner Expectations
- It is expected that the student will come prepared for the audio-narrated lectures by studying the assigned text, hand-outs, and lecture notes prior to class.
- That significant time and effort will be given in preparing problem-based learning; grades will be assigned relative to the scientific rigor evident in the final product.
- That significant time is required for studying the assigned readings, lectures, and notes throughout the term; studying for exams at the last minute will likely result in a poor grade.

Learning Resources:
- Textbook: Biochemistry, Fourth Edition Mathews, C.K., Van Holde, K.E., Appling, D.R., and Anthony-Cahill, S.J. This textbook will no longer be required for purchase but it is strongly encouraged to do so. The syllabus will still provide relevant reading from this book for each lecture topic. Two copies of the book will be available in the library for perusal.
- Lecture Material: All presentations will as a narrated “movie” of the powerpoint slides. The slides presented will be available as files that can be downloaded and printed from
Canvas. Many of these files are unavoidably large and therefore will take some time to download/print-out.

- **OSU Canvas will also contain the following useful information:** Narrated lectures found in My Video section/ PDFs of the powerpoint slides presented found in “Files”/Lecture topics/syllabus, announcements-- class cancellations, postponements, etc., and links to supplemental lecture material

**Evaluation:**

- **BB491 Students: 400 total points.**
  - Two midterm examinations (100 pts each) will provide ~50% of the total points given for the term.
  - Quizzes will constitute a maximum of 50 points. Seven quizzes will be given throughout the term; however, the two lowest quiz grades will automatically be dropped. Thus, quizzes will comprise 12.5% of the grade. **Because two quizzes may be dropped for any reason, typically there will be no allowances for make-ups.**
  - A 150 point final exam will be given (37.5% of the total points). This exam will be in two parts: a cumulative portion (50 points) and a non-cumulative portion (100 points). This non-cumulative portion will cover topics on new material presented after the second mid-term exam.

- **BB591 Students: 450 total points can be obtained**
  - Two midterm examinations (100 pts) will provide 40% of the grade.
  - Quizzes will constitute approximately 10% of the total points given. The top five quizzes (out of seven) will be counted as explained above.
  - A final exam will be provided (100 pts total) with a cumulative portion (50 pts) and non-cumulative set of questions on topics that were not covered on Midterm II.
  - Student assignment/term project (50 pts): students will be divided into groups where each one will develop a term project based on a topic related to the course but of their choosing. A jointly written term paper and a presentation to the 491 class on the topic chosen will complete the assignment. Participation will determine grading for this portion of the course. Dr. Hagen will discuss this assignment with the BB591 class and provide a rubric as to grading.
  - Some questions for the mid-term and final exams will be the same as those given to the BB491 students; however, other questions may change and emphasize problem-solving.

**Evaluation of Student Performance:** In the OSU online catalog, refer to AT 19 regarding assignment of grades: [http://catalog.oregonstate.edu/ChapterDetail.aspx?key=75#Section2886](http://catalog.oregonstate.edu/ChapterDetail.aspx?key=75#Section2886).

**Statement Regarding Students with Disabilities**

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.
Source: Disability Access Services, Faculty and Staff Responsibilities Before the Term (6-4-15).

Please note: “Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, no later than the first week of the term. In order to arrange alternative testing, the student should make the request at least one week in advance of the test.

**Statement of Expectations for Student Conduct:**
(http://studentlife.oregonstate.edu/studentconduct/offenses-0)
As several serious cases of academic dishonesty (i.e. cheating) have taken place in the class in the past, multiple security measures will be implemented to discourage such behavior. **The use of cell phones, PDAs or other electronic devices, other than calculators or clickers, are strictly forbidden during online exams. Students may be monitored by video surveillance during exams.** Additionally, you may not leave where you are taking the exam room to go to the restroom or any other reason without expressed permission of the proctor. There may be different versions of each exam. We are sorry that such procedures must be put into effect, but we also feel these measures are necessary in order to encourage academic honesty.

Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Regulations. Students are expected to be honest and ethical in their academic work. “Academic dishonesty” is defined as an intentional act of deception in one of the following areas:

- Cheating-use or attempted use of unauthorized materials, information or study aids
- Fabrication-falsification or invention of any information
- Assisting-helping another commit an act of academic dishonesty
- Tampering-altering or interfering with evaluation instruments and documents
- Plagiarism-representing the words or ideas of another person as one’s own

Behaviors disruptive to the learning environment will not be tolerated, especially in our Zoom Chatrooms, and will be referred to the Office of Student Conduct for disciplinary action.

“The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student’s freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.”

**Reach Out for Success:**
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it’s important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at [oregonstate.edu/ReachOut](http://oregonstate.edu/ReachOut). If you are in immediate crisis, please contact the Crisis Text Line
by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)