

University of Dayton Department of Health and Sports Science  
HSS 401/531 Nutritional Biochemistry I  
Fall 2012



Time: TR 3:00 PM – 4:15 PM

Instructor: Dr. Madeleine De Beer  
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Office Hours: TR 1:00 PM – 2:00PM (in Frericks 40)

**Course objectives:** The goals of this course are **1)** to introduce students to the language of biochemistry and help students to be comfortable using this language when describing basic biochemical processes as they relate to metabolism, **2)** help students to understand the relationship between chemical structure and biological function, **3)** have students learn how the catabolic and anabolic branches of macronutrient (carbohydrates, lipids, proteins) metabolism relate to energy production for cellular work, **4)** have students understand how the major catabolic and anabolic pathways of macronutrients are regulated and integrated in animal cells, and **5)** have students gain an appreciation for how the field of genomics is changing/impacting nutrition and exercise science

**Required textbook:** Advanced Nutrition and Human Metabolism, 6<sup>th</sup> Edition by Gropper and Smith

**Expectations:** Arrive on time to class, be focused on learning during the class period (i.e. do not use your cell phone), and come prepared to discuss the day's topics. While in class be respectful of instructor and fellow students. Class will be held on November 20<sup>th</sup>, the day before Thanksgiving break begins.

**Academic dishonesty policy:** Cheating, plagiarism, grade changes, and deception will be handled in accordance with the University policy and will result, in minimally, a failing grade for the test or assignment.

**Grades:** Course grades will be based on three exams ( 100 points each), one in class presentation (100 points), and one comprehensive final exam (200 points). Students enrolled in HSS 531 will also complete a literature assignment that will count as a maximum of 100 points towards their final grade. The following list of exam dates may be subject to change, with the exception of the final exam.

#### **Tentative Exam Schedule:**

Exam 1: Introduction, Chp.1, 2, 3 (through glycolysis)	September 18 <sup>th</sup>
Exam 2: Chp. 3(starting with tricarboxylic acid cycle), 4, 5	October 18 <sup>th</sup>
Exam 3: Chp. 6, 7	November 15 <sup>th</sup>

**Final Exam: December 12<sup>th</sup>, 10:10 AM -12:00 PM**

**Tentative Grading Scale:**

<u>%</u>	<u>Grade</u>
90+	A
88-89	A-
84-87	B+
80-83	B
76-79	B-
72-75	C+
68-71	C
64-67	C-
60-63	D
<60	F

**Student learning support:** The Learning Teaching Center (LTC) Office of Learning Resources (OLR) offers many types of learning support services for students. Contact OLR at 937-229-2066, or visit <http://go.udayton.edu/Learning> for more information.

**Students with disabilities:** "To request academic accommodations due to a disability, please contact the Office of Learning Resources, Roesch Library, room 207H (937) 229-2066. If you have a self-identification form from the OLS indicating that you have a disability which requires accommodation, please present it to me so we can discuss the accommodations you might need in the class."

**Test format:** Tests will be multiple choice format based on the textbook material, class lecture, and class discussion. The test questions will evaluate your knowledge of the course material as well as your understanding of important concepts. Due to the large number of topics covered in this course, not all material covered in class can be represented on the exams. However, students are strongly encouraged to master as much of the course content as possible and not try to guess which topics will show up on the exams. The final exam will be comprehensive, so topics that do not show up on the first three exams could show up on the final.

**Presentation:** Part of your course grade will consist of an in-class presentation of a primary literature article that focuses on the connections between genomics/genetics and one of the topics covered in chapters 1-7 in the textbook. More details will be outlined in a separate handout.

**Literature assignment (HSS 531 only):** Students enrolled in HSS 531 will be required to complete an additional assignment that will count towards their final grade. The goal of the assignment will be to extend the connections between genomics/genetics and the topic chosen for the in-class presentation. The literature assignment must be typed and

is due at the beginning of the final regularly scheduled class (December 6<sup>th</sup>, 2012). More detailed instructions will be outlined in a separate handout.

**Isidore:** Lecture notes in Microsoft PowerPoint format and class handouts will be available for download from Isidore (<http://isidore.udayton.edu>).

**Attendance:** Students are strongly encouraged to attend all class sessions. Test material will include topics presented in class that might not be discussed in the textbook.

**Test make-up and missed assignment policy:** Only in the rarest of emergencies should an exam be missed without making prior arrangements with the instructor. Accommodations for such situations will be handled on an individual basis at the discretion of the instructor. Make-up tests will likely be a different format than the original missed exam.

### **Suggestions for studying the material:**

It is easy to get overwhelmed by the sheer number of details in a biochemistry class. Therefore, give yourself plenty of time to prepare, and focus on identifying recurring patterns and themes. Some concepts that come up repeatedly in biochemistry and the study of metabolic processes in particular are listed below:

- 1) Catabolic and anabolic pathways are regulated in an opposing manner. When a catabolic pathway is active, the related anabolic pathway is not active.
- 2) Shared intermediates are a way to integrate and regulate seemingly unrelated pathways.
- 3) Many metabolic reactions are coupled reactions, with the energy supplied by the first reaction used to drive the subsequent reaction.

In addition, there is a need to understand the chemical language in order to make sense of the metabolic reactions. Therefore, there will be some emphasis on structure, and by extension how structure relates to function.

Chapters 1-7 will be covered this semester. The specific learning goals for each chapter are listed on the next page.

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**Tentative course content:**

Chapter	Topic	Learning goals
Course intro. and 1	Introduction to the basics in biochemistry and cell biology as they relate to metabolism	<p>Gain an overview of metabolic processes and how they relate to energy flow in living cells</p> <p>Become familiar with the organization of the plasma membrane and the role hydrogen bonding plays in determining molecular interactions</p> <p>Learn the basic structure and function of the mitochondrion</p> <p>Understand the function of the nucleus, the fundamentals of gene expression, and the related field of genomics (perspective)</p> <p>Gain an understanding of how cells store and use energy, with a focus on coupled reactions and how enzymes work</p>
2	The digestive tract	<p>Understand the structures of the digestive tract and accessory organs</p> <p>Learn the four mechanisms of absorption</p> <p>Understand how the digestive process is regulated</p>
3	Carbohydrate metabolism	<p>Learn the structural features of simple and complex carbohydrates</p> <p>Be able to recognize, name, and classify biologically important carbohydrates</p> <p>Understand the mechanisms for digestion, absorption, transport and distribution of carbohydrates</p> <p>Learn the main pathways of carbohydrate metabolism</p> <p>Understand how the pathways of carbohydrate metabolism are integrated and regulated</p>
4	Fiber	<p>Learn the chemistry and characteristics of dietary and functional fibers</p> <p>Understand important physical properties of fiber and how it relates to metabolism and human health</p>
5	Lipids	<p>Be able to recognize, name, and classify biologically important lipids</p> <p>Learn how lipids are digested, absorbed, transported, and stored</p> <p>Learn the main catabolic and anabolic pathways of lipid metabolism</p> <p>Understand how the pathways of lipid metabolism are integrated and regulated</p>
6	Proteins	<p>Learn the structures and chemical properties of the twenty common amino acids (the building blocks of proteins)</p> <p>Learn how proteins/amino acids are digested, absorbed, and transported</p> <p>Learn the main pathways of amino acid breakdown (catabolism) and protein synthesis (anabolism)</p> <p>Understand the basics of protein structure and the major functional roles of proteins in the cell</p>
7	Integration of metabolic processes	<p>Understand how the metabolism of carbohydrates, lipids, and proteins are interrelated, with special emphasis placed on shared intermediates and the central role of the liver</p> <p>Understand the regulatory role of insulin in metabolic pathways</p>