

## **BCH 5045 Graduate Survey of Biochemistry Syllabus**

**Fall 2015**

### **Course Description**

BCH 5045 – Credits 4; Prereq: Organic Chemistry or consent of the instructor. This course provides an introduction to general biochemistry for graduate students in the Life and Agricultural Sciences that have not previously taken a biochemistry course before, and/or for those that would like a refresher course before going on to more advanced biochemistry courses. The chemical properties of low molecular weight biochemical molecules, macromolecules and supermolecular complexes essential for life are discussed in addition to basic reaction mechanisms and the integration and regulation of biochemical processes. Relevance to everyday life is used to place into context the central role that biochemistry has come to play in everyday life in the 21st century. There is limited discussion for a few major biochemical techniques.

All lectures, course materials and communications will be in English.

### **Online Sections**

Section #1855 is for online only students on campus in Gainesville; #sections for students at RECs are 1G57 for FMEL Vero Beach; 186A for Gulf Coast REC; 186F for CREC; 1860 for FLREC and #13B7 is for distance ed students outside of Florida.

### **Instructor**

Dr. Charles Guy

1535 Fifield Hall

Department of Environmental Horticulture

University of Florida

Gainesville, FL 32611

Office (352) 273-4528

Email [clguy@ufl.edu](mailto:clguy@ufl.edu)

### **Office Hours**

I am in my office most days. While I don't set aside dedicated office hours, I am readily available to make appointments. To arrange an appointment email me or call me on the telephone as listed above.

Please do not text me. I do not communicate well by texting, and probably would not respond to you.

If you should need to speak to me face to face but cannot come to my office, I am happy to arrange a videoconference with you using Skype or another videoconferencing system at a time that would be convenient for you.

### **Course websites**

<https://lss.at.ufl.edu/>

<http://hort.ifas.ufl.edu/teach/guyweb/bch5045/>

The first web address is for the logon page to enter the Sakai website for the course. You will need to enter your Gatorlink ID and password to gain access to the course webpage in Sakai.

### **Required Text Options**

#### **Lehninger's PRINCIPLES OF BIOCHEMISTRY sixth edition**

by David L. Nelson and Michael M. Cox

<http://www.whfreeman.com/catalog/Product/lehningerprinciplesofbiochemistry-sixthedition-nelson>

Book Context Webpage

<http://www.whfreeman.com/Catalog/product/lehningerprinciplesofbiochemistry-sixthedition-nelson/formatsandpackages>

Lehninger Principles of Biochemistry, Sixth Edition continues a long tradition as a benchmark of biochemical text. It presents the fundamentals of biochemistry through selected topics, incorporating the most important recent developments and applications into a singular presentation of the field's classic core information and knowledge.

Every chapter is fully updated: Including coverage of the human genome and genomics integrated throughout, and key developments since the publication of the third edition, such as the structure of the ribosome. New coverage of DNA-based information technologies shows how advances in DNA technology are revolutionizing medicine and biotechnology; examines cloning and genetic engineering, as well as the implications of human gene therapy. This edition adds boxed features of biochemical methods, medical applications, and the history of biochemistry, adding to those already present of medicine, biotechnology, and other aspects of daily life.

#### **For students:**

Biochemistry in 3D molecular structure tutorials: Self-paced, interactive tutorials based on the Chemscape Chime molecular visualization browser plug-in. Chime tutorial archive provides links to some of the best Chime tutorials available on the Web. Online support is available for the Biochemistry on the Internet problems in the textbook. Flashcards on key terms from the text are also available. Online quizzing for each chapter, a new way for students to review material and prepare for exams. Animated

mechanisms viewed in Flash or PowerPoint formats give students and instructors a way to visualize mechanisms in a two-dimensional format. Living Graphs illustrate graphed material featured in the text.

### Lehninger Principles of Biochemistry

Cloth Text, 1100pgs.

ISBN: 0-7167-7108-X

ISBN-13: 978-0-716-77108-1

Estimated Price: \$TBA

### Text Alternatives

Lehninger Principles of Biochemistry eBook

(activation card)

Ebook

ISBN: 1-4292-1242-X

ISBN-13: 978-1-429-21242-7

Estimated Price: \$TBA

### Supplements to the Text (optional)

#### Also For Students

The Absolute, Ultimate Guide to Lehninger, Principles of Biochemistry, Fourth Edition: Study Guide and Solutions Manual, Marcy Osgood, University of New Mexico, and Karen Ocorr, University of California, San Diego, 0-7167-5955-1

The Absolute, Ultimate Guide combines an innovative study guide with a reliable solutions manual in one convenient volume. A poster-size Cellular Metabolic Map is packaged with the Guide, on which students can draw the reactions and pathways of metabolism in their proper compartments within the cell.

Lecture Notebook, 0-7167-5954-3

Bound volume of black and white reproductions of all the text's line art and tables, allowing students to concentrate on the lecture instead of copying illustrations. Also includes: Essential reaction equations and mathematical equations with identifying labels; Complete pathway diagrams and individual reaction

diagrams for all metabolic pathways in the book; References that key the material in the text to the CD-ROM and Web Site <http://www.whfreeman.com/lehninger/>.

### **Course Goal**

The course is intended to meet the needs of students wishing to gain an appreciation of biochemistry through the survey of basic biochemical principles and metabolic pathways common to prokaryotes, plants and animals. The overarching aim is to provide a foundational level of understanding of the biochemical mechanisms of cell function. The goal is to enhance one's knowledge and to benefit the student's future endeavors within all areas of the life sciences, and in their day-to-to personal lives as well.

### **General Course Objectives and Learning Outcomes**

- At the completion of the course, students should be able to:
- Possess a general understanding of the major types of biochemical molecules, including small, large and supermolecular components found in cells
- Be able to immediately recognize the different types of biochemical molecules and know their essential chemical characteristics that make them indispensable for life
- Understand basic energy metabolism of cells where does ATP, NADH and NADPH come from?
- Know the structure of DNA and RNA and why these molecules have different roles in the storage and decoding of the information of heredity and cell function
- Explain the fundamentals of regulation of gene expression
- Identify some of common reaction mechanisms in biochemical processes
- Describe how enzymes work and know how to determine basic enzyme kinetics
- Appreciate the central and essential importance of water as a polar solvent in biological chemistry
- Recognize the value of the importance of biochemistry in everyday life in the 21st century
- Appreciate the rapid increase in knowledge that is being acquired and applied to the understanding how cells and organisms function
- Comprehend the foundational role of biochemistry in the practice of medicine and medical research
- Appreciate the potential of basic science advances in biochemistry in the development of “translational applications” leading to new therapies and treatments in the fight against diseases, genetic maladies, pathogens, and chronic health conditions

- Appreciate the potential of basic science advances in biochemistry in the development of “translational applications” leading to new biotechnological advances in agriculture and bioenergy systems that increase food production, enhance the quality of life and help reduce environmental impacts

### **Course Expectations**

- Review the slide sets prior to viewing the lectures
- Keep current in studying the content of lectures and slide sets
- Prepare for weekly quizzes and major exams
- Complete the quizzes and exams as scheduled
- Prepare a “Biochemistry in the News” highlight of a recent news item, discovery, and technological application involving biochemistry for sharing with course peers on the course homepage
- Contribute regularly to the Discussion Forums at the course e-Learning website
- Participate in the online Q&A Chat Sessions prior to the major exams
- Maintain the highest ethical standards of academic honesty
- Try to make biochem fun and interesting

### **Course Organization**

The course is based on streaming video of lectures recorded live during in-class lectures in Fall 2013. All information contained in the lectures and slide sets will be fair game for exams unless stated otherwise. The pace of the lectures will be swift covering material from parts of most of the chapters in the text. Lecture slide sets and lecture streaming videos, based largely on the text, will be posted in advance on the course website and made available each week. You should review the slide set before viewing the lectures. Please be prepared to ask questions and make insightful comments about the assigned material throughout the duration of the course using the Chat feature of the SAKAI e-Learning course website at: <https://lss.at.ufl.edu/> or the Discussion forums feature of SAKAI. You can always email me if you have a question at any time during the week. As time permits, I will expand and embellish on the slide sets.

As your instructor, I will strive to make this course as relevant to both the professional and personal needs of all the members of the class. Lectures will be based on PowerPoint presentations using imagery from the required text and other appropriate sources.

## Course Schedule

Semester begins August 24, 2015

Final Exam Monday December 14, 2015

A calendar with all the dates for quizzes, exams and chat sessions can be found on the course website in SAKAI

Week	Lectures	Topics	Quiz or Exam	Other
Week 1	1-4	Introduction, Cells, Organic Compounds, Thermodynamics	None	Class Begins
Week 2	5-8	pH, Amino Acids, Peptide Bond, Proteome	Quiz 1 (Lectures 1-4)	Labor Day Holiday
Week 3	9-12	Proteins, Protein Function	Quiz 2 (Lectures 5-8)	
Week 4	13-15	Conformation, Enzymes, Ligand Binding	Quiz 3 (Lectures 9-12)	
Week 5	16-18	Enzyme Kinetics, Modifications	Exam 1 (Lectures 1-15)	
Week 6	19-22	Biosignaling, Nucleotides, Nucleic Acids	Quiz 4 (Lectures 16-18)	
Week 7	23-26	Nucleic Acids, Next-Gen Sequencing	Quiz 5 (Lectures 19-22)	
Week 8	27-30	Recombinant DNA, Chromatin	Quiz 6 (Lectures 23-26)	
Week 9	31-34	DNA Replication, DNA Repair, Transcription	Exam 2 (Lectures 16-30)	
Week 10	35-38	RNA, RNA Polymerase, Genetic Code	Quiz 7 (Lectures 31-34)	
Week 11	39-42	Protein Synthesis, Lac and Trp Operon, GAL Regulon	Quiz 8 (Lectures 35-38)	
Week 12	43-45	Gene Expression, Genome Editing	Quiz 9 (Lectures 39-42)	Veterans Day Holiday
Week 13	46-49	Carbohydrates, Polysaccharides	Exam 3 (Lectures 31-45)	
Week 14	50-52	Glycoproteins, Lipids, Glycolysis	Quiz 10 (Lectures 46-48)	Thanksgiving Holiday
Week 15	53-56	Glycolysis, Gluconeogenesis, Krebs Cycle, Electron Transport	None	
Week 16	57-60	ATP Synthesis, Photosynthesis, Membranes, Transport	Quiz 11 (Lectures 53-56)	
Week 17	-	None	Comprehensive Final Exam (Lectures 45-60, +)	Class Ends

## Course Computer and Internet Access Requirements

Minimum Computer Hardware Recommendation for BCH 5045

The following minimum hardware configuration is recommended:

## Sample Configuration for Windows

If you want to buy a computer with Windows, confirm that your college and degree program will support the operating system. Be sure to buy your computer with the potential to upgrade to Windows 8.

### Suggested Hardware Recommendation:

- Intel Core 2 Duo, or I series processor
- 4GB of RAM or more
- 256 Gigabyte Hard Drive or larger
- DVD-R/RW Drive
- USB ports (at least 2)
- 1366 x 768 or higher resolution monitor
- Video Card v Sound card
- Speakers or headphones
- WebCam
- Printer
- WiFi wireless networking on laptops
- Network (Ethernet) Adapter Card for Broadband -- 100mbit or 1Gbit
- Broadband connection to the Internet and related equipment (generally supplied by the service provider). Cable or DSL highly recommended.

1. All students should have dedicated access to a computer using a modern operating system such as Windows 7 or Mac OS X. Students should make sure to have access to a back-up computer (work, friend or relative's computer) in case of equipment failure.
2. A high-speed Internet connection is highly essential for accessing the lecture videos. Some wireless connections may also be problematic.
3. Your hardware should include speakers, microphone, or headphones for the presentations. A webcam is not necessary, but could be helpful for videoconferencing over the Internet

## Software Requirements

This software is available at no cost (the one exception is the MS Office suite, however there is a free alternative). Many technical problems you might encounter can be resolved by installing the latest version of the following software. Click on the logo(s) to download.

1. Firefox Web Browser – In order to simplify compatibility issues, we ask all students to access their courses using Firefox (Chrome, Internet Explorer or Safari have limited functionality)
2. Microsoft Silverlight – This plug-in is free for downloading and is required to view the lecture videos for the course. <http://www.microsoft.com/silverlight/>
3. Adobe Flash Player – Many courses include A/V presentations which require the Flash Player. Some of the videos useful for BCH 5045 may require the Flash Player. <https://get.adobe.com/flashplayer/>
4. Adobe Reader – Many courses include .pdf documents which require Adobe Reader. <http://www.adobe.com/support/downloads/product.jsp?platform=windows&product=10>
5. Java Runtime Environment – Many courses incorporate content which requires JRE. <http://www.oracle.com/technetwork/java/javase/downloads/index.html>

Windows-based computers are the dominant choice in most University of Florida academic programs. Students considering purchasing other platforms, such as a Mac, should carefully examine the requirements and recommendations of their academic programs.

## Computer Performance

Most students at UF will take courses that will use online delivery and communications. Many of these courses use Sakai. The minimum recommendation provided here is one that ensures that a student will have a reasonable use experience when dealing with online and learning materials. More importantly a smooth experience will make learning more effective for the student.

Lectures will be delivered live and by streaming video. Because the file format is very large for a 50-minute lecture at a suitable resolution, a high speed broadband internet connection is absolutely required. Broadband is any connection to the customer of 256 kbit/s (0.256 Mbit/s) or more. The FCC definition of broadband is 200 kbit/s (0.2 Mbit/s) in one direction, and advanced broadband is at least 200 kbit/s in both directions. Check with your Internet service provider to determine the data transmission rate of your connection.

The steaming video content can be viewed using Windows Media Player or other equivalent player.



## Evaluation and Grading

Course grades will be based on 620 points.

- There will be three exams worth 100 points each and a partially comprehensive final exam worth 200 points.
- There will be 11 weekly quizzes each worth 10 points. Quizzes will be given at the beginning of each week, and require no more than 10 minutes to complete. The lowest quiz grade will be dropped.

## Biochemistry in the News (BITN)

- BITN which means “Biochemistry in the News.” Everyone will submit a contribution to BITN and it will be worth 10 points. Details follow below. Your BITN will be due according to the first letter of your last name: A, week 2; C, week 3; D/F, week 4; G/J, week 5; K, week 6; L, week 7; O/P week 8; S, week 9; T, week 10; V, week 11; W/X, week 12; Y, week 13; Z, week 14. I may adjust this schedule if more students enroll in the course this week. The assignment will consist of providing one report on a biochemical discovery or finding or new application of biochemistry. The report will contain a journal or appropriate news citation with at least one peer-reviewed reference describing the discovery, finding or application; a URL address for linking to the paper or news report; and a brief commentary (3-5 sentences) describing the discovery, finding or application.

The format of your submission should be exactly as shown below. Date, interesting short title that you create, contributor(your name), URL to the news article, 3-4 sentences about the news item in your own words, reference for a peer-reviewed journal source for the news item, URL where readers can find the journal article if they wish to read more about the news item.

### EXAMPLE BITN

October 25, 2013

#### "Scientists Create a Super Antioxidant"

**Contributed by: Sudarshan Aryal**

**URL to news article:** <http://www.sciencedaily.com/releases/2013/10/131015123700.htm>

Biochemist at Rice University, Houston, Texas developed small, uniform spheres of cerium oxide (an antioxidant that can absorb and release oxygen ions in a chemical reaction) coated with oleic fatty acid making it biocompatible. It could turn out to be a potential treatment for traumatic brain injury, cardiac arrest and Alzheimer's patients, and also may protect against radiation-induced side effects suffered by cancer patients. It has also been suggested that it may help protect astronauts from long-term exposure to radiation in space, and it may even slow the ageing process.

**Journal Source:** Seung Soo Lee, Wensi Song, Minjung Cho, Hema L. Puppala, Phuc Nguyen, Huiguang Zhu, Laura Segatori, Vicki L. Colvin. Antioxidant Properties of Cerium Oxide Nanocrystals as a Function of Nanocrystal Diameter and Surface Coating. ACS Nano, 2013: 130930105903002 DOI: 10.1021/nn4026806

**Journal Source URL:** <http://www.ncbi.nlm.nih.gov/pubmed/24079896>

### **Chats and Discussion Forums**

- Participation in Chats and the Discussion Forums is a course requirement. You will receive 1 point each time you participate in a Live Chat with me or a Discussion Forum conversation on any biochemical topic relevant to the course up to a total of 10 points. (Ask a question, answer a question, make comment, offer a biochemical explanation for something in everyday life, etc.)

### **Extra Credit**

- Extra Credit: If you come across a really cool game or software tool that helps one learn or use biochemistry, submission of that to me and the class can earn you 5 extra credit points. Similarly, if you use or discover a really good website that has tools that biochemistry researchers (molecular biology, genomics, proteomics, metabolomics or any other omics, computational biochemistry, physical and structural biochemistry, molecule or structural viewer) use that could also earn 5 extra credit points. I will be the sole arbitrator as to whether submission warrants the extra points or not.

**Total Extra Credit points earned cannot exceed 5 points.**

### **Make Up Quizzes and Exams**

During the course of the semester, I know from experience that “real life” happens over the period of course. For some members of the class, there will be circumstances that are not in their control which will lead to a missed quiz or exam.

Missed quizzes and exams will count as a zero unless an arrangement to take a make-up is made PRIOR to the test date, or until you have discussed with me the reason for missing a quiz or exam. Make-up quizzes or exams will be arrangement on an individual basis at the discretion of the instructor.

If you know in advance you are going to be out of town, at a professional meeting, or engaged in another activity that prevents you from properly preparing or taking a quiz or exam, please let me know so that we can make alternative arrangements for you.

One final word on this topic, I don't want your grade in the course to reflect a legitimate reason for an unrepresentative performance on a quiz or exam. If you get sick, have an accident or other event that prevents you from performing at your best, contact me and we can make an arrangement that will let you be at your best during a quiz or exam.

<b>Grading Scale:</b>	<b>Percentages</b>	<b>Grade</b>	<b>Grade Point Equivalent</b>
583 and above	>94	A	4.00
552-582	89-93	A-	3.67
521-551	84-88	B+	3.33
490-520	79-83	B	3.00
459-489	74-78	B-	2.67
428-458	69-73	C+	2.33
372-427	60-68	C	2.00
310-371	50-59	C-	1.67
307 and below	<49	S	0.00

Grades will be rounded to the nearest whole percentage point.

Please refer to the UF policy on Grading and Grades

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**The grading scale WILL NOT be adjusted or curved.**

### **University of Florida Honor Code**

The University of Florida Honor Code was recently revised (9/24/2008) and may be found in the Regulations of the University of Florida under section 6C1-4.041

Preamble: In adopting this Honor Code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the University community. Students who enroll at the University commit to holding themselves and their peers to the high standard of honor required by the Honor Code. Any individual who becomes aware of a violation of the Honor Code is bound by honor to take corrective action. Student and faculty support are crucial to the success of the Honor Code. The quality of a University of Florida education is dependent upon the community acceptance and enforcement of the Honor Code.

### **The Honor Pledge:**

"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Honor Code."

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid in doing this assignment."

REMINDER: YOU HAVE SIGNED THE FOLLOWING STATEMENT

"I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

### **Software Use**

The principles for using and managing software derive from U.S. copyright law, the Florida Computer Crimes Act, and legal agreements in the form of licenses and purchase agreements. That foundation makes the basic policy governing software clear:

All faculty, staff, and students of the University of Florida are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

### **Distance Education Courses**

Each online distance learning program has a process for, and will make every attempt to resolve, student complaints within its academic and administrative departments at the program level. See <http://distance.ufl.edu/student-complaints> for more details.

### **University of Florida Counseling Services**

If during the course of the semester you experience a personal crisis, help is available through the Counseling and Wellness Center is located at 3190 Radio Rd. The phone number is 352.392.1575.

If you or someone you know is experiencing a crisis: the Counseling and Wellness Center (CWC) is available to help. Students presenting in emergency circumstances during office hours will be seen by Center staff to provide timely assistance. CWC counselors also provide consultation to faculty and staff working in crisis situations where student well-being in a classroom or other university setting is of concern.

### **Access to Emergency Services**

Radio Road Site: Students can walk-in to the CWC Radio Road site located at 3190 Radio Road (just west of the Lakeside Residence Hall complex) Students, faculty and staff can contact the CWC by calling 352-392-1576

Peabody Hall Site: Students may also be brought by faculty and staff to the CWC Crisis and Emergency Resource Center located on the 4th floor of Peabody Hall [adjacent to Criser Hall]. Faculty and Staff may contact the CERC by calling 352-392-1576.

### **Hours of Operation:**

Radio Road – The CWC at 3190 Radio Road is open from 8-5 Monday through Friday. We have some limited appointments available from 5-7 Monday through Wednesday. Your initial appointment needs to be scheduled during regular office hours. You may talk to your counselor about availability after 5 pm.

Peabody Hall Crisis and Emergency Resource Center: Office hours are Monday through Friday 8:00 a.m. – 5:00 p.m.

### **Evening and Weekend Resources**

For urgent concerns occurring after business hours or on the weekend, phone consultation services are available by calling: the Counseling and Wellness Center at (352) 392-1575 or the Alachua County Crisis Center (352) 264-6789.

If immediate safety is a concern, call 911

More information is available on the web at: <http://www.counseling.ufl.edu/cwc/default.aspx>

### **Evening and Weekend Resources -**

For emergencies occurring in the evening or on the weekend, crisis-counseling services are available through the Alachua County Crisis Center by calling 264-6789. Students may also call the clinician on-call at Student Mental Health for phone call back and consultation at 392-1171.

### **Students with Disabilities Act**

Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act of 1990 are the primary pieces of legislation that affect postsecondary institutions and students with disabilities.

The Rehabilitation Act of 1973 was designed to empower individuals with disabilities to gain employment, economic self-sufficiency, independence, inclusion and integration into society. Section 504 of the Rehabilitation Act of 1973 was designed to ensure that any program or activity receiving federal assistance did not discriminate on the basis of disability for “otherwise qualified” individuals. No “otherwise qualified” individuals, solely by reason of their disabilities can “be denied the benefits of, be excluded from participation in, or be subjected to discrimination” in these programs.

Reasonable accommodations are established by the Disability Resource Center (DRC). Students with disabilities are issued accommodation letters which specify their accommodations and are responsible for providing the letters to their faculty members. Upon receipt of the accommodation letter, a faculty member is responsible for reviewing the information in the letter and providing the requested accommodations. If there are any questions or concerns about the information contained in the letter, a

faculty member should immediately contact the Disability Resource Center. Unless the DRC is contacted, it can only be assumed that there are no questions or concerns with any particular student's accommodation package. Most classroom accommodations are easy to arrange and will not take much time to administer. If, however, assistance is needed, please contact the DRC. The Disability Resource Center attempts to make the accommodation process as efficient and effective as possible for everyone involved.

August, 2015