

Spring 2025

Lectures: Monday/Wednesday; 11:00am-12:20pm

Lecture Location: MRF 206

Lab: Wednesday, 8:00-10:50 am

Lab Location: ZHS 460

Instructor: Charles Kiktuaro Crawford (Kiki), PhD

Office: PED 109

Office Hours: TBD

Course Description

- Gastrointestinal physiology and energy metabolism as it relates to macronutrient intake. Theories and principles of nutrition and their impact on metabolic regulation. This course is a pre-requisite for HBIO 407L.
- This course is intended to introduce HBIO majors to the physiological principles associated with the digestion and absorption of macronutrients as well as the chemical basis of the major catabolic and anabolic pathways associated with carbohydrate and lipid metabolism. Food digestion and absorption as well as cellular metabolism are the foundation of life; food intake dictates energy intake and cellular metabolism regulates energy output. Upon completion of this course, students should be able to think about energy intake and output at the cellular level and be able to assess the impact of dysregulation on disease development.

Learning Objectives

- to describe the structure/function of selected cells, tissues, organs and organ systems of the gastrointestinal tract
- to describe the metabolic pathways associated with lipid and carbohydrate metabolism
- to relate the knowledge of nutrition and metabolism to a healthy lifestyle
- to correlate circulating metabolic markers with dietary intake
- to develop and execute research hypothesis related to nutrition and health
- to use research articles to defend a scientific argument
- to complete a research experiment using biological instrumentation, perform statistical analysis and report data
- to recommend ways by which dietary and physical activity interventions in different socioeconomic environments could help resolve the obesity epidemic
- to discover and discuss the impact of human diversity as manifested by age, disability, gender, ethnicity and social status on nutritional deficits

Prerequisite:

- BISC 220L or BISC 221L

Technological proficiency and Hardware/Software required

- An internet-enabled device with browser capabilities, such as a tablet or laptop/desktop computer
- This course requires the use of Brightspace. Brightspace will be used for all course communication and access to course materials and grades.
- This course also requires the use of Microsoft Word, Excel and Powerpoint.
- USC Technology Rental Program (<https://itservices.usc.edu/spaces/laptoploaner/>): Students who are in need of resources to participate in this class can apply to the university's equipment rental program. The Student Basic Needs team will work with you to distribute equipment (if you are eligible). Please visit <https://studentbasicneeds.usc.edu/resources/technology-assistance/> to apply and for more information.

Required Readings and Supplementary Materials

•When ordering books online from the bookstore, please go to usctext.com and you can either select in-store pick-up or have them shipped to their home.

- 1) **The Science of Nutrition**, 5th edition, Thompson, J.L., Manore, M,M, and Vaughan, L.A. Benjamin Cummings, San Francisco, CA, 2016.

The Science of Nutrition textbook is available at the Bookstore, on Amazon or if you go directly to the publisher's website. Amazon has this book available as e-text for rent or download.

- 2) **Biochemistry (Illustrated Review)**, 7th edition, Ferrier, D. Wolters Kluwer/Lippincott Williams & Wilkins, United Kingdom.

The Biochemistry (Illustrated Review) textbook can be purchased at the bookstore, on Amazon or if you go directly to the publisher's website. Amazon has this book available as e-text for rent or download. This book can also be found under the "View Online" option of the link below which is linked to the USC library. Before access is provided, you will be prompted for your USC credentials.

https://uosc.primo.exlibrisgroup.com/permalink/01USC_INST/hs9vaa/alma991043480725303731

- 3) **Lab Manual; available in the bookstore**

Sharing of Course Materials Outside of the Learning Environment is Strictly Prohibited

•USC has a stric policy (SCampus Section 11.12[B]) that prohibits sharing of **any** course content outside of the learning environment. Any student who violates this policy will be prosecuted to the maximum extent allowable by the USC Student Conduct Code, including failure of the course and suspension from the University.

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy).

Description and Assessment of Assignments

- Class material will be evaluated via three exams (two midterms & one final) and one lab grade.
- Grades will be recorded in the Brightspace gradebook except for the final exam.

Exams

- There will be three exams; two midterms and one final exam. The exams will provide a summative assessment of your understanding of the material covered in class. The final exam will be cumulative.
- A midterm exam can be taken after the specified date **ONLY** if the student has a **documented** excuse. A request to take a make-up exam must be accompanied by evidence of necessity (illness, travel with a USC team). Make-up exams will be different from the scheduled exam and will be proctored by different personnel.
- The final exam is **cumulative**.

Labs

- The lab grade will be calculated from lab reports and exams, which will be explained in detail by your lab TA or lecturer.

Grading Breakdown

Assignment	% of Final Grade
Midterm 1	20
Midterm 2	20

Lab Grade	25
Final Exam	35

Grading Scale

- A grade of zero will be applied to submitted work that does not comply with the USC standards of academic conduct. Such work may not be resubmitted for a new grade.
- Course final grades will be determined using the following scale:

A	94-100
A-	90-93.99
B+	87-89.99
B	83-86.99
B-	80-82.99
C+	77-79.99
C	73-76.99
C-	70-72.99
D+	67-69.99
D	63-66.99
D-	60-62.99
F	≤59.9%

Attendance

Class attendance for lectures is not monitored and does not count towards your course grade, but students are responsible for all material presented in lectures. Attendance is highly recommended as the in-class discussions will help you to better understand the presented concepts. Lectures will not be provided online or recorded.

Lab Attendance

IMPORTANT NOTICE: As laboratory experiential learning is crucial to meeting the learning objectives of this course you must have completed a significant number of the assigned weekly lab activities before the final lecture exam. The number of assigned weekly lab activities that must be completed before the final lecture exam will be explained to you in detail during the first lab meeting of the semester. Student athletes with approved "Travel Request Letters" and students who give advance notice of religious observation conflicts, as well as verified medical issues, will be allowed to make-up the lab assignments.

Technology in the classroom

- You may use personal electronic devices (laptops, ipads) for academic purposes directly related to the class. Students using a device for purposes not directly related to the class will be required to put the device away.
- Please turn off or disable all cell phones or other electronic communication devices during class time.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work. (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Course Schedule

Date	Lecture Topic	Reading Chapters	
		Thompson	Ferrier
Jan. 14	Course Overview/General introduction	3	
Jan. 16	Gastrointestinal Anatomy/Physiology	3	
Jan. 21	Gastrointestinal Anatomy/Physiology	3	
Jan. 23	Gastrointestinal Anatomy/Physiology		
Jan. 28	Digestion / Absorption of Carbohydrates	4	7
Jan. 30	Digestion / Absorption of Proteins	4	7
Feb. 4	Digestion / Absorption of Lipids	6	19
Feb. 6	Stem Cells of the GI Tract		
Feb. 11	Gustatory & Olfactory Physiology		
Feb. 13	Diet and Cognitive function	6	15, 17
Feb. 18	Midterm I		
Feb. 20	Introduction to Metabolic Pathways		
Feb. 25	Glycolysis		8, 9, 11
Feb. 27	Carbohydrate Transport and Lactate		
Mar. 4	PPP/ Fructolysis		16
Mar. 6	Glycogenolysis / Gluconeogenesis		16
Mar. 11	TCA Cycle and Oxidative Phosphorylation		6, 9
Mar. 13	TCA Cycle and Oxidative Phosphorylation		6, 9
Mar. 18	Spring Break		
Mar. 20	Spring Break		
Mar. 25	Lipid Metabolism		10, 11
Mar. 27	Lipid Metabolism		10, 11
Apr. 1	Regulation of Carbohydrate and Lipid Pathways		
Apr. 3	Homeostatic Control of Food Intake and Homeostasis		
Apr. 8	Midterm II		
Apr. 10	Morning Sickness		
Apr. 15	Diets		
Apr. 17	Lactation and Infant Nutrition		
Apr. 22	Alcohol Metabolism / Endocannabinoid System		
Apr. 24	Sports Nutrition		
Apr. 29	Gut Microbiome		
May 1	Final Exam Review		
TBA	Final Exam		

Academic Dialogue

The foundations of academic learning are rooted in our capacity to listen to each other, learn from each other, and respect each other, particularly when we disagree with each other. Academic dialogue is not about winning, but about learning together.

As our understanding of science is constantly evolving, so are the terms used in scientific discussions. Therefore, there are terms and concepts that are in the process of being updated by the scientific community but remain outdated, and do not reflect our current values of equity or inclusivity (e.g., the use of a binary dichotomy of men vs women in current medical nutritional guidelines). Despite our own personal values and beliefs, such terms and concepts are part of a global science curriculum and thus will be covered in this class in order to best prepare students professionally. We acknowledge the fact that terms and concepts are in the process of being updated to better reflect our evolving understanding of science and humanity, and hope that you and your colleagues will continue to advocate for and build an equitable academic community in your classrooms and beyond.

HBIO Policy on Use of Generative AI – For the lecture portion AI is/will be permitted on specific assignments

In this course, you could use artificial intelligence (AI)-powered programs to help you only with assignments that indicate the permitted use of AI. You should also be aware that AI text generation tools may present incorrect information, biased responses, and incomplete analyses; thus, they are not yet prepared to produce text that meets the standards of this course. To adhere to our university values, you must cite any AI-generated material (e.g., text, images, etc.) included or referenced in your work and provide the prompts used to generate the content.

Using an AI tool to generate content without proper attribution will be treated as plagiarism and reported to the Office of Academic Integrity. Please review the instructions in each assignment for more details on how and when to use AI Generators for your submissions. This does NOT apply to you Lab assignments, where every instructor will inform you with their AI policy.

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.