BISC221Lg: Advanced General Biology: Cell Biology and Physiology

Section: 13013
4 units
Lecture Meeting days/time: Monday, Wednesday, Friday 10:00-10:50
Location: Zumberge Hall (ZHS) 252

Instructor: Cameron Egan, Ph.D. (he/him)
Office: Hancock Foundation Building (AHF) 141
Office Hours: Tuesday and Friday, 2:00-3:00 pm (and by appointment)

- Office hours are open for drop-ins and dedicated entirely to you. During these hours, my office door is open, and all are welcome!
- I also have availability outside of my scheduled office hours. Please contact me via email to set up an appointment.

Contact Info: camegan@usc.edu

Laboratory Manager: Dr. Brett Spatola
Contact Info: spatola@usc.edu

Laboratory Instructors: Dr. Christa Bancroft, cbancrof@usc.edu, Dr. Nancy E Castro ncastro@usc.edu , Dr. Rory Spence rspence@usc.edu

Course Description

BISC221Lg is an advanced introductory course that will expose students to an in-depth survey of key topics related to advances in our knowledge of cellular biology and physiology; cell composition/metabolism; gene action; organism structure and function. Recommended preparation: high school chemistry; BISC 120Lg or BISC 121Lg.

Learning Objectives

At the end of the course, you will be able to:

- Explain how the properties of water contribute to life processes, including cohesion, adhesion, and solvent capabilities.
- Describe the unique properties of carbon that make it the backbone of biomolecules, enabling the diversity of life.
- Identify the structure and function of carbohydrates, lipids, proteins, and nucleic acids, emphasizing their roles in cellular processes.
- Illustrate how monomers form polymers through dehydration synthesis and how polymers break down into monomers through hydrolysis.
- Compare the structures and functions of prokaryotic and eukaryotic cells.

- Analyze the structure of cell membranes, emphasizing the fluid mosaic model and the role of phospholipids, proteins, and carbohydrates.
- Explain how membrane structure relates to its function in selective permeability, transport, and cell signaling.
- Describe how cells receive and respond to signals, including the roles of receptors, second messengers, and amplification pathways.
- Relate the stages of signal transduction (reception, transduction, and response) to cellular communication and homeostasis.
- Outline the structure of DNA and RNA, highlighting the flow of genetic information from DNA to RNA to proteins (Central Dogma).
- Explain how gene expression is regulated in eukaryotic cells.
- Compare and contrast the processes and outcomes of mitosis and meiosis, emphasizing their roles in growth, repair, and reproduction.
- Explain the principles of metabolic pathways, including the role of enzymes in catalyzing biochemical reactions.
- Summarize the processes of aerobic respiration, fermentation, and photosynthesis, connecting them to energy flow in ecosystems.
- Describe the structure and function of animal circulatory and respiratory systems, emphasizing their role in gas exchange and nutrient transport.
- Explain how plants transport water, minerals, and sugars through xylem and phloem, and the adaptations supporting these processes.
- Describe the roles of neurons and the nervous system in signaling and information processing.
- Describe the functions of hormones in plants, focusing on how they regulate physiological and behavioral responses.

Website: https://brightspace.usc.edu/
Brightspace will be your home base for this course! Please check frequently for announcements and course materials including lecture slides, quizzes, additional/supplemental readings, and grades.

Textbook
Lecture: Campbell Biology 12th Edition

- New textbooks come bundled with online resources including Mastering Biology™ which is highly recommended for studying but not required.
- Older versions of the text are fine to use, just be aware that figure and page numbers may differ from the latest version.
- This is the same textbook that you had for BISC121.

Laboratory:

- Lab manual chapters posted as PDF files on Brightspace

Laboratory Description

Labs follow a Course Based Undergraduate Research Experience (CURE) format. Please refer to the lab syllabus from your lab section on Brightspace for more detail.

Evaluation Criteria and Grading

Exams:	The lecture portion of this course will include four midterm examinations and a final examination. All examinations (midterms and final) may include multiple choice questions, fill in the blanks, matching, definitions, short answers, and quantitative problems. The final exam is non-cumulative.
Quizzes:	There will be 10 multiple choice quizzes to be completed on Brightspace during the semester. The quizzes will be posted approximately 11:00 A.M. on Fridays and will remain available until 9:00 A.M. the following Monday. First Brightspace quiz will be posted on Jan 24th.
Laboratory:	Your laboratory score will be assessed within your respective laboratory section.
Grading:	Your final grade in the course will be determined using the breakdown shown in Table 1 below. Grades will be updated continuously throughout the term as assessments are completed.

Table 1. Grading Breakdown
The course grade will be based upon 500 possible points:

Assessment	**Points**	**% of Grade**
Quizzes	30	3%
Midterm Exam 1 (February 10)	150	15%
Midterm Exam 2 (March 10)	150	15%
Midterm Exam 3 (April 7)	150	15%
Final Exam (May 12, 8:00 am -10:00 am)	150	15%
Laboratory	370	37%
TOTAL	1000	100

Course Grading Scale

Course final grades will be determined using the following scale:

Letter grade	Corresponding numerical percentage range
A	90 – 100
A-	86 – 89
B+	82 – 85
B	78 – 81
B-	74 – 77
C+	70 – 73
C	66 – 69
C-	62 – 65
D+	58 – 61
D	54 – 57
D-	50 – 53
F	49 and below

Grading Curve Policy

To ensure both equity and academic rigor in the evaluation process, a grading curve may be applied to final scores at the end of the term. This curve is designed to account for unforeseen variations in assessment difficulty while maintaining fairness across the class.

The curve will not penalize high-performing students or artificially inflate grades but will aim to reflect a balanced and realistic distribution of outcomes. Adjustments, if necessary, will be based on overall class performance, ensuring that final grades align with expected academic standards.

Students are encouraged to focus on mastery of course material rather than grades and comparisons with peers. Any curving adjustments will prioritize consistency and fairness.

Tentative Lecture Schedule

Following is a tentative schedule of topics for the term which may subject to modification dependent on time and learning needs.

Date		Deliverables	Class Topic	Readings/Preparation
Jan 13	(Mon)		Introduction to Course	Syllabus
Jan 15	(Wed)		Biomolecules - Water and Life	Ch 3.1-3.3
Jan 17	(Fri)		Biomolecules - Carbon the Biological Backbone	Ch 4.1-4.3
Jan 20	(Mon)		**No class - Martin Luther King Jr. Day**	
Jan 22	(Wed)		Biomolecules - Macromolecules, Carbohydrates, and Lipids	Ch 5.1-5.3
Jan 24	(Fri)	Quiz 1	Biomolecules - Proteins and Nucleic Acids	Ch 5.4-5.5
Jan 27	(Mon)		Touring the Cell - Eukaryotic cell and Endomembrane System	Ch 6.2-6.4
Jan 29	(Wed)		Touring the Cell - Energy, Cytoskeleton, and Connection to Neighbours	Ch 6.5-6.7
Jan 31	(Fri)	Quiz 2	Cell membranes - Structure	Ch 7.1-7.2
Feb 03	(Mon)		Cell membranes - Function	Ch 7.3-7.5
Feb 05	(Wed)		Cell Communication - Signal Reception	Ch 11.1-11.2
Feb 07	(Fri)		Cell Communication - Signal Response	Ch 11.3-11.4
Feb 10	(Mon)		**Midterm 1**	
Feb 12	(Wed)		Genetic Material	Ch 12.1, 16.1, 17.1
Feb 14	(Fri)		Genetic Expression	Ch 17.2-17.4
Feb 17	(Mon)		**No class - President's Day Holiday**	
Feb 19	(Wed)		Regulation of Gene Expression	Ch 18.2-18.3
Feb 21	(Fri)	Quiz 4	The Cell Cycle	Ch 12.2-12.3
Feb 24	(Mon)		Meiosis	13.1-13.4
Feb 26	(Wed)		Metabolism	Ch 8.1-8.5
Feb 28	(Fri)	Quiz 5	Respiration - Aerobic Respiration	Ch 9.1-9.4
Mar 03	(Mon)		Respiration - Fermentation	Ch 9.5, 9.6
Mar 05	(Wed)		Photosynthesis - Light Reactions	Ch 10.1-10.3
Mar 07	(Fri)		Photosynthesis - Dark Reactions and Alternative Mechanisms	Ch 10.4-10.5
Mar 10	(Mon)		**Midterm 2**	
Mar 12	(Wed)		Animal Form and Function	Ch 40.1-40.3; Fig 40.17
Mar 14	(Fri)		Plant Form and Function	Ch 35.1-35.2; Fig 35.19
Mar 17	(Mon)			
Mar 19	(Wed)		**No class - Spring Recess**	
Mar 21	(Fri)			
Mar 24	(Mon)		Animal Circulatory System and Gas Exchange	Ch 42.1-42.3
Mar 26	(Wed)		Animal Circulatory System and Gas Exchange	Ch 42.4-42.7
Mar 28	(Fri)	Quiz 6	Transport in Vascular Plants	Ch 36.2-36.5
Mar 31	(Mon)		Animal Nutrition	Ch 41
Apr 02	(Wed)		Immune Response in Animals	Ch 43.1-43.3
Apr 04	(Fri)		Plant Defenses	Ch 39
Apr 07	(Mon)		**Midterm 3**	
Apr 09	(Wed)		Osmoregulation and Secretion	Ch 44.1-44.3
Apr 11	(Fri)	Quiz 7	Osmoregulation and Secretion	Ch 44.4-44.5

Date		Deliverables	Class Topic	Readings/Preparation
Apr 14	(Mon)		Hormones and Endocrine System	Ch 45.1-45.2
Apr 16	(Wed)		Hormones and Endocrine System	Ch 45.3
Apr 18	(Fri)	Quiz 8	Neurons and Signalling	Ch 48.1-48.2
Apr 21	(Mon)		Neurons and Signalling	Ch 48.3-48.4
Apr 23	(Wed)		Nervous System - Structure	Ch 49.1-49.2
Apr 25	(Fri)	Quiz 9	Nervous System - Function	Ch 49.3-49.4
Apr 28	(Mon)		Sensory Receptors	50.1-50.4
May 30	(Wed)		Muscle Contractions	50.5 (Fig 50.29, 50.32), 50.6
May 02	(Fri)	Quiz 10	Plant Movement	Ch 39.1-39.4

Course Specific Policies

Communication – I am here to support you in your learning and want you to be in contact with me as much as possible. The best way to reach me is by email. In your communication, please be sure to include the course in the subject line (**BISC221**) so I will be better suited to respond to your email. I do my best to respond to emails within 24hr (during the week) and on Monday if your email is sent over the weekend. If it has been more than 24hrs please send me a gentle reminder.

Quizzes – Throughout the course, ten quizzes each worth 3 points, will be administered via Brightspace to assess your understanding of the material presented in lectures during that week. Quizzes will become available on Fridays at 10:00 am (PT) and will be due (and no longer be available) by the following Monday at 9:00 am (PT), unless otherwise noted. You may use your lecture notes, the textbook or other resources to complete these quizzes, however, I strongly encourage you to treat these quizzes as "mini" exams and prepare accordingly.
The style, format and difficulty level of the quiz questions are designed to be similar to exam questions, and thus, these quizzes are meant to serve as "problem sets" that provide you with an opportunity to practice and prepare for the exams. As with all other assignments in the class, there are no make-up or extensions for quizzes, unless you provide a valid reason for missing a quiz in writing. Forgetting that the quiz is available or due etc., are not valid reasons.

Policy on Re-grading Exams – If you feel that an error was made in the grading of an exam, please use the following steps: 1) Double check the answer key and think critically about the responses provided, 2) Prepare a **written statement** explaining why you feel your grade was incorrect which includes references of lecture material. Submit the request along with your original exam to your lab instructor. You cannot alter the exam or take the exam out of the lab if you want a re-grade. Your entire exam will be subject to a re-grade and, as a result, your grade may increase or decrease from a requested re-grade.

Policy on Missed Exams – Exam dates are firm and there are no make-up exams given in this course. You may be excused from a midterm exam in the event of a documented illness, emergency, or other extreme circumstance beyond your control. No other excuses for missing exams will be accepted. Please be proactive in your request by sending an email to Professor Egan requesting that you be excused. If a midterm exam is missed, your exam grade will be provided on a pro-rated based upon your score on the remaining three exams.

If you miss the final exam and have provided a valid medical excuse within 48 hours of the exam time, a final course grade of Incomplete (IN) will be recorded and you will be permitted to take a make-up final exam during the following semester.

Extra Credit – **No extra credit will be given** for special projects, etc.

Impairments Affecting Your Performance – Students occasionally encounter difficulties that affect their academic performance, such as illness, accidents, bereavement, depression, anxiety, learning disabilities, and other problems. If you encounter such difficulties, please bring them to the attention of one of the instructors. We can refer you to resources and may be able to offer accommodation. All such discussions will be confidential. Please seek help as soon as you feel your performance is being affected.

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. 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. (Living our Unifying Values: The USC Student Handbook, page 13).

Course Evaluations

Course Evaluations will be conducted towards the end of the semester and will appear in the 'Course Evaluations' tab on the Blackboard. It is an important review of your experience in the class with the intent being for you to provide feedback on my teaching practice. Please take the time to complete these evaluations as I use these to help improve/strengthen my teaching. I welcome all constructive feedback!

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:
Learning Support & Resources - You are part of a learning community made up of faculty, staff, and fellow students. Follow the link to find resources to help support your academic growth and success!

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.