BSC3307C: CLIMATE CHANGE BIOLOGY

COURSE DETAILS

Course Number: BSC3307C

Credit Hours: 4

Semester: fall 2023

Class meeting time and location: This course is delivered asynchronously and entirely facilitated 100% online. A synchronous component will be delivered once each week beginning the second week at times determined by student availability.

INSTRUCTOR

Stephen Mulkey, Ph.D.

Office Location: 621 Carr Hall

Email: Please use the Canvas Inbox Tool; Personal issues related to the course use smulkey@ufl.edu

Phone: 208.596.3234 – please use respectfully and protect my privacy

OFFICE HOURS

Included during live synchronous evening meetings, and by appointment. Please contact me to schedule an individual online Zoom conference.

COURSE WEBSITE

http://elearning.ufl.edu/

COURSE COMMUNICATIONS

Please use the Canvas Inbox Tool. Inquiries received Mondays through Fridays will usually receive a reply with 24 hours of receipt; however, if you have not received a reply within 48 hours, please resend your inquiry.

OPTIONAL TEXTBOOKS

There are no textbooks required for this course. The lectures and assigned readings are the primary sources of content. *The three books listed here are strictly optional.* One is from 2021 (copyright 2022) by a leading authority (Hannah) has the appropriate components for a course such as this. You may find it useful as a foundation.

Climate Change Biology Third Edition. Hannah. 2022. Academic Press. ISBN: 9780081029756

Climate Change Biology. Newman et al. 2011. Cabi International. ISBN: 978845936709 *(use for basic topic review of climate change biology if needed)*

Environment and You. Christensen et al. 2019. Pearson. ISBN: 9780134646053 *(use for review of ecology and environmental science if needed)*

COURSE DESCRIPTION

The course covers climate change and its impacts on biological communities, feedbacks from the biosphere to the climate system, and human impacts on the carbon cycle. Impacts of climate change on human health are reviewed. Readings and discussions will emphasize the response of plants and animals to climate change and rising atmospheric CO_2 concentrations and the role of terrestrial and marine ecosystems in regulating climate via the carbon cycle.

PREREQUISITE KNOWLEDGE AND SKILLS

BSC 2011 and BSC 2011L with minimum grades of C.

COURSE GOALS AND/OR OBJECTIVES

By the end of this course, students will be able to:

1. Apply knowledge of how climate change and living systems interact at the organismal, species, ecosystem, biome, and planetary levels of organization.
2. Describe markers of climate change related biogeochemical cycles, species survival, and shifting ecosystems.
3. Use peer-reviewed literature as a foundation for communicating about climate change and living systems.

4. Analyze the global nature of climate change and utility of proposed mitigation techniques.

INSTRUCTIONAL METHODS

This course is delivered in a fully online format, using instructor delivered lecture videos, peer-reviewed literature, and additional resources from online sources. Students will be expected to review and synthesize these materials to participate fully in course assignments, quizzes, exams, and discussions. A synchronous component will be delivered once a week at times determined by student availability.

ADDITIONAL RESOURCES

Additional readings are included through the Canvas pages for each week through the UF Library, as pdf downloads directly from your course pages, or available directly from the publisher website. If alternative versions of these resources are needed for any reason, please contact your instructor and accommodations will be provided. IMPORTANT: Use UF VPN to connect via the UF net if you are not on campus and avoid the cumbersome library proxy service.

TYPES OF READINGS

(1) **Required readings.** These are papers from the peer-reviewed literature or other credible science sources that you are required to review. These will be provided in two forms – a direct link to the publisher website and a pdf. The direct link will provide accessibility to all students. The pdf will be available for those who do not have accessibility issues**. IMPORTANT:** Access to the publisher website will usually require the use of UF VPN. This registers your computer with the publisher as part of the subscription package purchased by the University of Florida.

(2) **Discussion readings.** These are papers from the peer-reviewed literature or other credible science sources that form the basis of your discussion assignments. These will be provided in two forms – a direct link to the publisher website and a pdf. The direct link will provide accessibility to all students. The pdf will be available for those who do not have accessibility issues**. IMPORTANT:** Access to the publisher website will usually require the use of UF VPN. This

registers your computer with the publisher as part of the subscription package purchased by the University of Florida.

(3) **Literature.** These are papers from the peer-reviewed literature that form the basis of lectures. **They are made available as links to the published journal articles and official reports strictly for your collection. They are not required readings.** You will not be directly tested over these papers. Materials from the lectures and required readings will form the basis of your essay exams.

COURSE POLICIES

COURSE EXPECTATIONS

Online learning requires you to manage time effectively and carefully review information communicated through the course syllabus, announcements, and e-learning website. You are expected to schedule worktimes for yourself, checking the course site at least 5-7 times per week. Not having read the information in this syllabus or in instructor announcements will not constitute an excuse for missing an assignment, exam, or other assessment. Please be aware that this is a 4-credit course and requires more time than is typical for courses worth lower credit.

If you have questions about assignments, policies, or any course content, it is important that you contact me in a timely manner for clarification. I understand that during this semester, you may experience challenging personal or professional situations, which may take your attention away from this course. It is important that if you are having trouble in the class to communicate with me as soon as a difficulty occurs.

A PROMISE TO YOU

If you keep up with the lectures, turn in the assignments on time, and interact with me and your classmates, you will succeed in this course. Participation in discussions and development of your independent project are critically important for your success. The amount of material can be daunting. Part of my job is to make the science accessible. I will help you as you work your way through the modules. Please keep me informed of your individual progress and alert me if you need help.

SYNCHRONOUS LIVE TUTORIALS AND VIDEO INTRODUCTION TO MODULE

At least once during each module the I will hold live, synchronous tutorials. The time for these tutorials will be determined by student availability and will most likely be in the evening on a weekday. The time and day may vary to allow as many students as possible to participate.

In addition, each module will be introduced through a video review of the readings and assignments.

These additional resources are intended to provide you with context and expert analysis beyond that available in the lectures. Note that the literature on climate change biology is rapidly growing and changing. Thus, the version of this course developed for fall 2022 has in some cases been eclipsed by recent developments. During the tutorials and video introductions I will review some of the most important recent developments.

IMPORTANCE OF A LEARNING COMMUNITY AND SOCIAL ENGAGEMENT

Our species is obligately social and studies of the neurobiology of learning have repeatedly demonstrated that social facilitation and positive affective engagement produce the best outcomes. Climate Change biology is based on understanding of systems rather than rote memorization. Systems are best described and understood from multiple points of view. This means that if you participate in the synchronous tutorial, I strongly recommend that you have your camera turned on so that you can engage with the instructor and your classmates.

Message from the Academic Policy Council: Our class sessions may be audio-visually recorded for students in the class to use in the course and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate verbally are agreeing to have their voices recorded.

If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared.

I encourage you to employ critical thinking and to rely on data and verifiable sources to interrogate all assigned readings and subject matter in this course as a way of determining whether they agree with your classmates or me as your instructor.

Although no lesson is intended to espouse, promote, advance, inculcate, or compel a particular feeling, perception, viewpoint or belief, I am sure that you realize that climate change has been a polarizing topic. The information can produce a strong affective response. You will find that my statements about the impact of climate change on the Earth System are derived from the best peer-reviewed literature that I can find.

REQUIRED AND RECOMMENDED READINGS

You are responsible for the interpretations of all assigned Required readings. Read carefully and critically. Recommended readings are perhaps less critical for your understanding, but worth your time for brief review. Note that the readings designated "Literature" will be posted for your information and will not be a required part of the course.

ASSIGNMENT/QUIZ/EXAM DATES/POLICIES

As part of BSC3307C you are required to complete online assignments. If at any time you have questions about these assignments, please contact me. A schedule will be posted on e-Learning with the due dates for each assignment. All assignments must be completed by the stated due date and time for credit. Extensions will not be given because of technical or personal issues that occur within 24 hours of the assignment deadline. Many assignments will also have a set time limit, so make sure you have time to devote to that assignment before you begin. You are expected to work by yourself on the assignments and cheating will not be tolerated. No course that I teach will *ever* use *Honorlock* or similar software to monitor exams. These tools are invasive and foster distrust.

MAKE-UP POLICY

Requirements for class attendance, make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the Undergraduate Catalog's Academic Regulations.

DUE DATES

All assignments are due by 11:59 P.M. (ET) on the date specified in Canvas. **Assignments and due dates will be available within each module.** No assignments will be accepted after the due date without my explicit approval. You are advised to make back-up copies of all work and submit your work early to avoid technical problems.

COMMUNICATION AND QUESTIONS

When you have a question about the assignments, check the following sources first to see if it is already answered, before e-mailing me:

- Course Syllabus
- e-Learning Announcements (this is the primary means that communicate with you in a timely manner)
- e-Learning General Posts
- General Course Questions

If you still cannot find the answer to your questions:

If it is a question specific to you (e.g. account or grade specific), contact me. Barring unusual circumstances, expect a reply with 24 hours (48 hours on weekends; do not expect an immediate response in the evenings). E-mails and eLearning Discussion posts are checked at least once per day, but sometimes not more than that.

COURSE TECHNOLOGY

This course is facilitated 100% online through Canvas. You may access Canvas from UF's e-Learning webpage: http://elearning.ufl.edu/. For any questions related to UF's e-Learning platform, contact:

- http://helpdesk.ufl.edu
- (352) 392-HELP - select option 2

REQUIRED STUDENT TECHNOLOGY

This course will involve video conferencing and online engagement. To participate in the course, you must have:
(1) a stable internet connection capable of supporting video and audio
(2) laptop or another computer with internet capability. *Chromebooks will not work for some aspects of the course*
(3) camera and microphone capability on your computer or as add-ons

ZOOM CONFERENCING

Zoom is a video conferencing tool that allows for screen sharing and real-time communication at a distance. It also allows for synchronous communication to be recorded for later viewing. View the Zoom Privacy Policy here.

I will use Zoom for conferences to meet with you and discuss your plans for your project and report. Further instructions will be provided in Canvas.

Peer presentations for your Project will be recorded and shared using Zoom conferencing. You may also use Google Groups, so long as the final product is available for all in the class to view. For guidelines on using Zoom, please view the project assignment guidelines.

ONLINE COURSE EVALUATION

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semesters, but you will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.

COMMERICAL SALE OF COURSE LECTURES

The content presented in the class is the property of UF and may not be duplicated in any format without permission from UF and may not be used for any commercial purposes. Students violating this policy may be subject to disciplinary action under the UF Conduct Code.

USE OF COURSE IMAGERY AND MULTIMEDIA

No part of the PowerPoints or other instructional content posted on Canvas may be reproduced, shared, or posted in any form outside of the class without permission in writing from Stephen Mulkey.

UF POLICIES:

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

UNIVERSITY POLICY ON ACADEMIC CONDUCT

UF students are bound by The Honor Pledge which states, "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." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies several behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

CLASS DEMEANOR OR NETIQUETTE

All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. See the UF Netiquette Guide.

Although the scientific consensus is essentially 100% on its basic features, climate change remains a politically charged topic. ***Regardless of politics or background, we will assiduously adhere to the most validated peer-reviewed science.*** Base your interactions on this science and the direct conclusions that are logically indicated by the science. The authorities that are entrusted to make these conclusions are the IPCC and other UN agencies, the USGCRP and its partner US agencies, and the major government-sponsored research groups throughout the developed world. ***Please avoid using the gray literature and reports in popular media except where it is defensibly based on validated peer-reviewed science and recognized authority.***

GETTING HELP

For issues with technical difficulties for Canvas, please contact the UF Help Desk at:

- http://helpdesk.ufl.edu
- (352) 392-HELP (4357)
- Walk-in: HUB 132

Any requests for make-ups due to technical issues must be accompanied by the ticket number received from the Help Desk when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Other resources are available at http://www.distance.ufl.edu/getting-help for:

- Counseling and Wellness resources
- Disability resources
- Resources for handling student concerns and complaints
- Library Help Desk support

Should you have any complaints with your experience in this course please visit http://www.distance.ufl.edu/student-complaints to submit a complaint.

GRADING POLICIES

METHODS BY WHICH STUDENTS WILL BE EVALUATED AND THEIR GRADE DETERMINED:

EXAMS (25%): You will have two Exams in this course, one Midterm and one Final Exam. Both will be essay based, wherein you will select from a list of topics and respond according to the prompts provided. You will be allowed 200 minutes to answer four long-format essay questions. A list of eight possible essay questions will be distributed at least two weeks in advance of the exam date. The four exam questions will be chosen from these questions. Preparation for the exams should be based on review of the possible questions and an outline of your answer for each. You may have access to your outlines during the timed exam. Exams are open-book and the internet and provided

course resources may be used to develop your answers. If you find that you are finished well before the time is up, I suggest that you consider that you may have not developed adequate essays for each of your answers.

Your answers must be in your own words and must reflect scholarship as well as comprehension and synthesis. When you can, cite a reference in the text of your answer (as author and date only), but complete citation is not necessary. You will not be assessed on use of language or grammar, but clarity and proper use of scientific terminology are important. The grading rubric is included in Canvas. You should be aware that answers to these questions should be fully developed with sufficient detail to demonstrate your understanding of literature and the lectures. Answers to the exam questions *are not brief essays* that you may have been asked to provide in other courses.

TERM PROJECT (25%): Each group will be assigned to a theme for development within Canvas. Each member of the group will select an aspect for construction of an annotated bibliography, peer-reviewed presentation, and final report.

- Part 1: Submission topic for each theme group member.
- Part 2: Submission of topic description of your chosen topic.
- Part 3: An annotated bibliography
- Part 4: Presentation (recorded via Zoom) given by each of you on your aspect of your group theme.
- Part 5: Provide feedback to two peers within your theme group.
- Part 6: Submit final project report written by each of you in their own words drawing on the collective literature from the group for your topic.
- More detailed instructions are posted separately for each aspect of the assignment. A more detailed review of these requirements has been posted to the course website.

QUIZZES (25%): Module Quizzes provide you with an opportunity to apply what you have learned in the module. You are encouraged to seek out correct answers from the module content and activities. The module quizzes should be used to gauge and assess

your comprehension of course materials and concepts and prepare for your Midterm and Final Examinations.

- Quizzes have 20 multiple choice questions and two short answer questions.
- The time limit is 60 minutes, and you will have only one attempt for each quiz. You may use your notes.
- After you have submitted the quiz, your graded responses along with the correct answer will be available for the multiple-choice part of the quiz.

Please submit the quiz by the due date. Specific due dates are listed in Canvas, and all quizzes are due by **11:59 PM (ET) on the specified due date.**

Please allow five business days from the due date for quiz feedback on free-response questions. Instructor comments will appear on the right side. Contact the instructor via the Canvas Inbox Tool to clarify any questions or quiz responses.

DISCUSSIONS (15%): There are several modules having discussion forums. These are opportunities to extend what you have learned in the same module. Students are expected to adhere to professional etiquette/netiquette standards as outlined above (see UF Policies) in all posts and to engage in constructive dialogue. Posts are expected to be thoughtful, detailed responses (i.e., "yes," "no," "I agree," or "I disagree" answer is not sufficient).

You are expected to contribute your thoughts about one of the topics available in each module as indicated in the Assignments portion of Canvas. Each discussion is worth 10 points. You will receive 6 points for your original and thoughtful contribution, and 4 points for responding to at least two of your peers posts. See the rubric attached to each discussion for additional grading criteria.

In most cases, discussions require some research or reading before initial post. Follow-up posts are typically required. For discussion forum assignments, **timeliness is critical,** and due dates should be strongly adhered to. Please check the course schedule for the specific due dates.

EXTERNAL MEDIA AND SYNCHRONOUS TUTORIALS (10%): Determined by engagement with group projects, video quizzes, and synchronous tutorials. You must complete each video assignment by viewing the entire presentation and answering all associated

questions by the assigned due date. Attending a live tutorial in person or via recording is worth 8 points and requires a report for each.

COURSE GRADING

Item	Percentage Weight
Exams (Midterm and Final)	25
Term Project	25
Module Quizzes (drop lowest)	25
Discussions	15
Live tutorials	8
External Media Quizzes	2

GRADING SCHEME

A 100 % to 94.0%
A- < 94.0 % to 90.0%
B+ < 90.0 % to 87.0%
B < 87.0 % to 84.0%
B- < 84.0 % to 80.0%
C+ < 80.0 % to 77.0%
C < 77.0 % to 74.0%
C- < 74.0 % to 70.0%
D+ < 70.0 % to 67.0%
D < 67.0 % to 64.0%
D- < 64.0 % to 61.0%
E < 61.0 % to 0.0%

Note that the current UF policy for assigning grade points is available at the following undergraduate catalog web page: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

LETTERS OF RECOMMENDATION: Please do not request a letter of recommendation unless you have cultivated a professional relationship with me. Getting an A in my course is not sufficient. I need to know much more about your professional development before I can write a meaningful letter.

COURSE SCHEDULE

Module	Topic	Activity	Due Dates
	Orientation and syllabus	Orientation video and quiz	28 August
1 (begins 28 August)	Climate change causes and processes	Survey for live session time	1 September
		Discussion External media quiz Quiz	3 September
2	Climate change impacts	Discussion Live session exposition External media quiz Quiz	10 September
3	Models, emissions, carbon cycle	Discussion Live session exposition External media quiz Quiz Project part one	17 September
4	Impacts on species distribution and	Discussion Live session exposition Quiz	24 September

	abundance		
5	Phenological responses	Project part two Midterm exam study guide available	25 September
		Discussion Live session exposition External media quiz Quiz	1 October
6	Disrupted ecosystems	Discussion Live session exposition External media quiz Quiz	8 October
7	Paleoclimate	Discussion Live session exposition External media quiz Quiz	15 October
8		Midterm exam	19-22 October
		Discussion Live session exposition External media quiz Quiz	22 October
		Begin project part 3	Due on 29 October
9	Land use and land cover change	Discussion Tutorial exposition External media quiz Quiz	29 October

		Mid-semester report Project part 3 Begin project part 4	Due on 5 November
10	Climate change and human health	Discussion Live session exposition External media quiz Quiz	5 November
		Project part 4	6 November
		Begin project part 5	Due on 12 November
11	Conservation	Discussion Live session exposition External media quiz Quiz Project part 5	12 November
12	Climate interventions	Discussion Live session exposition External media quiz Quiz Peer reviews due	26 November
13	Climate change mitigation	Discussion Live session exposition External media quiz Quiz	3 December
		Second midterm exam	3-6 December
Final report			11 December

Disclaimer: This syllabus represents my current plans and objectives as of 24 August 2022. As we go through the semester, those plans may need to change to enhance the class learning opportunities and meet logistics. Such changes, communicated clearly, are not unusual and should be expected.

ABOUT STEPHEN MULKEY

"Stephen Mulkey is an environmental scientist dedicated to developing undergraduate and graduate programming to build society's capacity for environmental mitigation, adaptation, and resilience. Mulkey was the president of Unity College in Unity, Maine from 2011 through 2015. His leadership and forward-looking vision resulted in Unity College being the first college in the U.S. to divest its endowment from the top 200 fossil fuel companies, and the first college in the U.S. to adopt sustainability science as the framework for all academic programming. Mulkey believes that higher education has an ethical duty to prepare generations of graduates for the extreme sustainability and climate change challenges of this century. During and after earning his PhD at the University of Pennsylvania, he spent over twenty years as a tropical forest ecologist affiliated with the Smithsonian. Mulkey has served as tenured faculty at three doctoral granting universities, as science advisor to the state of Florida, and as a program officer at the National Science Foundation."

You can see more of Mulkey's writings at environmentalcentury.net