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COURSE SYLLABUS

Caribbean Marine Ecology

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Course Schedule: May 20-31, 2024 with 2 pre-departure lectures and a pre-departure swim evaluation to be scheduled.

Table of Contents

Course Description – Page 2	Coursework and Grading – Page 7-8
Course Objectives – Page 2	University Policies – Pages 8-9
Readings – Pages 3-4	
Classroom Policies – Pages 5-7	

Level: Undergraduate

Course Format & Methodology: This course is a collaborative course with students and instructors from three universities (Bentley University, Florida International University, and LUMCON) coming together to participate in an international field intensive held in May. While there will be students and instructors from three universities, LUMCON students will report directly to Dr. Archer, who will be responsible for their pre-departure instruction, grading, feedback, and logistic support. The international portion will take place in person on Abaco Island, The Bahamas. We will meet prior to the trip via zoom for content and logistics discussions. You will be responsible for material both prior to and during travel to Abaco.



Course Description

The United Nations Millennium Ecosystem Assessment determined that the Caribbean is the region in the world that is most dependent on tourism for jobs and income, largely due to the natural resources and seemingly pristine nature of ecosystems that make the Caribbean alluring to visitors. Yet increasingly, human activities such as global climate change, nutrient pollution, overfishing, and habitat destruction are seriously affecting the ability of the Caribbean to sustain its tourism-based economy, and provide additional valuable ecosystem services (i.e., benefits provided for humans by ecosystems) to its residents and beyond. **As such, it is critical to better understand the role that Caribbean ecosystems play in providing cultural, economic, and environmental benefits to humans and to explore conservation efforts to protect these critical services.**

This is an intensive 10-day long, field-oriented course focused on understanding the ecosystem services provided by terrestrial and aquatic environments endemic to the Caribbean region. Specifically, students will explore the cultural, health, economic, and ecological importance of Bahamian ecosystems, and learn about the role that humans play in influencing these environments. Students will explore course content through daily field activities, lab analyses, guest lectures, tours, and self-reflection.

Course Objectives

1. Identify (and compare) distinguishing characteristics of Caribbean terrestrial and aquatic ecosystems, including key flora and fauna within each system
2. Analyze the role that humans play in affecting services provided by Caribbean ecosystems, and how humans may play a role in protecting and/or restoring these ecosystems
3. Demonstrate understanding of ecological and human health benefits provided by Caribbean ecosystems
4. Generate an understanding and appreciation of the synergies and connections between local Caribbean non-governmental organizations and other stakeholders working to solve environmental problems that affect Caribbean ecosystems and their services
5. Reflect on personal experiences related to course content, activities, and cultural or social interactions that have affecting your learning experience

Text & Media provided by Instructor:

Readings, videos, and podcasts will be available on LUMCON's Moodle page and on Google Drive (link to be shared upon enrollment) and will cover topics that span ecological, biological, cultural, and economic disciplines. Readings and media must be read, viewed, or listened to, by the date listed on Moodle, and will provide context for field experiences, laboratory activities, and daily interactions while on Abaco. Readings and media are listed below:

If there isn't a link given for the reading you can find a PDF of the paper/article on Moodle or in the in the corresponding folder Google Drive. If you are having trouble accessing a link, please let your instructor know ASAP.

All readings are required unless specified otherwise (with OPTIONAL before the citation)

Ecosystem Services

- Ecological Society of America. 2000. “Ecosystem Services”, pp 1-2.
- Barbier, E.B. 2017. “Marine Ecosystem Services”. *Current Biology*. R507-R510.
- Radiolab. 2014. “How do you put a price tag on nature?” Podcast - <https://radiolab.org/episodes/what-dollar-value-nature>

Marine and Terrestrial Ecosystems and Human Impacts

- Hughes, T.P., et al. 2003. “Climate change, human impacts, and the resilience of coral reefs”. *Science* 301: 929-933.
- Woodhead, A.J. et al. 2019. “Coral reef ecosystem services in the Anthropocene”. *Functional Ecology* 33: 1023-1034.
- Nature Podcast. 2019. “Podcast: How to save coral reefs as the world warms”. <https://www.nature.com/articles/d41586-019-03810-y>
- Waycott, M. 2009. “Accelerating loss of seagrasses across the globe threatens coastal ecosystems”. *PNAS* 106(30): 12377-12381.
- Bell, J. J., S. K. Davy, T. Jones, M. W. Taylor, and N. S. Webster. 2013. “Could some coral reefs become sponge reefs as our climate changes?” *Global Change Biology*: 2613–2624.
- Organisation of Eastern Caribbean States. 2009. “Biodiversity of the eastern Caribbean: Mangrove Swamps”. https://www.oecs.org/perb_docs/bc_part2d_mangroves.pdf
- Bahamas Plastic Movement. 2020. “Plastic Warriors”. <https://vimeo.com/441716859>
- OPTIONAL: Fall, P. L., P. J. van Hengstum, L. Lavold-Foote, J. P. Donnelly, N. A. Albury, and A. E. Tamalavage. 2021. Human arrival and landscape dynamics in the northern Bahamas. *Proceedings of the National Academy of Sciences* 118: e2015764118.
- OPTIONAL: Ferguson, B. 2021. “Climate Change is Destroying my Country. The Nations Causing it Must Help.” *New York Times*, June 27, 2021. <https://www.nytimes.com/2021/06/23/magazine/climate-change-impact-bahamas.html>

Cultural Perspectives

- Todunter, A. 2010. “Deep Dark Secrets”. *National Geographic*.
- National Geographic. “These Divers Search for Slave Shipwrecks and Discover their Ancestors”. https://www.youtube.com/watch?v=u2l_EugvRw8&t=2s
- Saunders, G. “The People and Cultures of The Bahamas”.
- Gibbens S. 2019. “The Bahamas iconic conch could soon disappear”. <https://www.nationalgeographic.com/animals/article/conch-decline-overfishing-the-bahamas>
- George Symonette. *Spongers Money* (.mp3)



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Provisioning Services

- Corfield, G. S. 1938. Sponge Industry of the Caribbean Area. *Economic Geography* 14: 201.
- Sealey, N. 2015. Bahamian Pine Forests, a History of Logging from 1905 to 1972
- The Nature Conservancy. 2018. Spiny Lobster: Sustainable Seafood in the Bahamas. <https://blog.nature.org/2018/09/10/spiny-lobster-sustainable-seafood-in-the-bahamas/>
- OPTIONAL: A second reading on the MSC certification of the Bahamian Spiny Lobster fishery: <https://seafoodsustainability.org/a-first-for-caribbean-fisheries-bahamas-spiny-lobster-earns-msc-certification-2/>

Climate Justice. Storms, and the devastating similarities between Abaco and Southern Louisiana

- Ferguson, B. 2019. Hurricane Dorian was a Climate Injustice. <https://www.newyorker.com/news/news-desk/hurricane-dorian-was-a-climate-injustice> (a pdf is also provided in case you hit a pay wall).
- Lai, R. K.K., D. Watkins, N. Koppel, and A. Singhvi. 2019. They survived Hurricane Dorian. Their community will not. A Picture Story. <https://www.nytimes.com/interactive/2019/09/25/world/americas/hurricane-dorian-abaco-island-bahamas.html?action=click&module=RelatedLinks&pgtype=Article>
- Chavez, R., S. Lane. 2021. Climate change's uneven impact on communities of color compounded by uneven flow of aid. A video news segment. <https://www.pbs.org/newshour/show/climate-changes-uneven-impact-on-communities-of-color-compounded-by-uneven-flow-of-aid>
- Laughland, O. and B. Tarnowski. 2021. 'Ida is not the end': Indigenous residents face the future on Louisiana's coast – photo essay. <https://www.theguardian.com/us-news/2021/sep/12/hurricane-ida-louisiana-pointe-aux-chenes-isle-de-jean-charles>
- Wolf, R. and E. Kask. 2021. After Hurricane Ida, Louisiana Bayou Community Contemplates Moving or Rebuilding. <https://www.wsj.com/articles/after-hurricane-ida-louisiana-bayou-community-contemplates-moving-or-rebuilding-11631439002>

Optional Readings on Hurricane Dorian

- OPTIONAL: Avila, L. A., S. R. Stewart, R. Berg, and A. B. Hagen. 2020. Hurricane Dorian. AL052019. National Hurricane Center.
- OPTIONAL: Haitian Deportations after Dorian. <https://www.nytimes.com/2019/10/10/world/americas/haiti-bahamas-dorian-deport.html>
- Pedersen. J.M. 2021. 2 years since Hurricane Dorian, the Bahamas struggles to recover thanks to added COVID-19. <https://www.orlandosentinel.com/weather/hurricane/os-ne-hurricane-dorian-bahamas-2-year-anniversary-covid-19-20210901-nkdjbhjb6vakxkg6vego3hu7ma-story.html>



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Course Policies

Field Experiences

This is predominantly a field-based course. Students will be expected to participate in activities such as snorkeling and light hiking that are physically strenuous and potentially dangerous. **In a field environment, students MUST immediately comply with any directions given by either instructors or staff participating in facilitation of the field experience (e.g., tour guides, boat captains). A failure to follow the directions given by either instructors or staff may result in immediate removal from the field experience. Instructors and staff have FULL discretion to remove a student from the field if they believe that the safety of the student or group is at risk.** Personal flotation devices will be required of students at all times.

Attendance and Participation

Not only will your physical attendance be marked in class, but your contribution to in-class and field discussions, questions, and class decorum will also be considered. Active participation will be marked on a per day basis. The rubric for grading class participation is seen below.

Grade	Criteria
Absent	<ul style="list-style-type: none">○ Not present
Below average	<ul style="list-style-type: none">○ Present, not disruptive.○ Tries to respond when called on but does not offer much.○ Demonstrates very infrequent involvement in discussion.
Average	<ul style="list-style-type: none">○ Demonstrates adequate preparation, knows basic course facts, but does not show evidence of trying to interpret or analyze them.○ Offers straightforward information (e.g., straight from the case or reading), without elaboration or very infrequently (perhaps once a class).○ Does not offer to contribute to discussion but contributes to a moderate degree when called on.○ Demonstrates sporadic involvement.
Above average	<ul style="list-style-type: none">○ Demonstrates good preparation, knows material well, has thought through implications of them.○ Offers interpretations and analysis of material (more than just facts) to class.○ Contributes well to discussion in an ongoing way, responds to other students' points, thinks through own points, questions others in a constructive way, offers and supports suggestions that may be counter to the majority opinion.○ Demonstrates consistent ongoing involvement.
Excellent	<ul style="list-style-type: none">○ Demonstrates excellent preparation: has analyzed material exceptionally well, relating it to readings and other material (e.g., readings, course material, discussions, experiences, etc.).○ Offers analysis, synthesis, and evaluation of material, e.g., puts together pieces of the discussion to develop new approaches that take the class further.○ Contributes in a very significant way to ongoing discussion, keeps analysis focused, responds very thoughtfully to other students' comments, contributes to the cooperative argument-building, suggests alternative ways of approaching material and helps class analyze which approaches are appropriate, etc.○ Demonstrates ongoing very active involvement.



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Professionalism

Professionalism will be graded according to the rubric seen below (source, NAU.edu).

	Time Management	Respect	Preparedness	Quality of Work	Teamwork
Unprofessional	Late to class regularly; demands exceptions to class/ college or university policies not including institutional excuses	Is asked to leave class due to behavior that distracts others; is often extremely disrespectful to peers, adults, and the learning environment both in and out of class	Never participates in class; no evidence of preparation; when called upon, can't answer questions in depth or refer to readings; any comments made are usually irrelevant	Provides work that reflects very little or no effort; shows negative behavior; is often not honest; knowingly violates class, college, or university academic dishonesty policies	More than a few complaints from team members about lack of contribution; does not contribute in a meaningful way to group work
Participating	Late to class more than twice; misses two deadlines; seeks exceptions to class/college or university policies not including institutional excuses	Recurring behavior that distracts others; recurring use of unapproved electronic devices; is not consistently respectful of peers, adults, and the learning environment both in and out of class	Rarely participates in class; contributions reflect adequate or less than satisfactory preparation and are occasionally substantive, somewhat substantiated and occasionally persuasive; when called upon, often cannot answer questions in depth or refer to readings; may dominate discussion with irrelevant comments	Provides work that reflects a good effort and occasionally needs to be checked or redone; rarely shows negative behavior; is honest; does not knowingly violate class, college, or university academic dishonesty policies	A few complaints from team members about lack of contribution
Professional	Late to class only once; almost never misses a class; no unexcused absences. generally takes responsibility for material and work missed; no more than one deadline missed; does not seek exceptions from class/college or university policies except institutional excuses	Exhibits behavior that distracts others once or twice during the semester; rarely uses unapproved electronic devices in class; is almost always respectful towards peers, adults, and the learning environment both in and out of class	Regularly participates in class discussions; contributions reflect good preparation and are generally substantive, fairly well substantiated, and moderately persuasive; when called upon, can usually answer questions and refer to readings; occasionally dominates discussion	Provides high quality work that often reflects best effort; makes moderate effort to improve work; shows positive, proactive behavior; is always honest; always adheres to class, college, and university academic dishonesty policies	One or two complaints from team members about lack of contribution; occasionally takes leadership role
Highly Professional	Always arrives on time and stays for entire class; regularly attends class; all absences are excused; always takes responsibility for work missed; no deadlines missed; does not seek exceptions from class/college or university policies except institutional excuses	Careful not to distract others (socializing, sleeping, leaving early or during class, reading unrelated material, doing homework for another class or wearing inappropriate attire); never uses unapproved electronic devices in class; is respectful towards peers, adults, and the learning environment both in and out of class	Almost always participates in class discussions; contributions reflect exceptional preparation and are always substantive, well supported, and persuasively presented; does not dominate discussion	Provides work of the highest quality that reflects best effort; makes strong effort to improve work; shows positive, proactive behavior; is always honest and encourages other to do the same; always adheres to class, college, and university academic dishonesty policies	Makes obvious and significant contributions on projects in terms of timeliness in completing assigned work, making genuine effort to work effectively with others and providing valuable, creative, competent skills to the

Class Decorum

Learning is an active experience. Never be afraid to comment, ask questions, or offer answers to questions. Have opinions, even if they are controversial. The classroom is a safe environment – you get credit simply for participating.

One of the major goals of this course is for you to find it relevant. Please share things in your personal experience, everyday life, or readings that you find to be relevant or might be of interest to your classmates.

Moodle

This course will make extensive use of Moodle. PowerPoint files (in PDF) will be posted for each class (or group of classes) along with animations, readings, and study materials. Announcements will be posted on Moodle and also sent by email. Interim grades will be posted on Moodle for assignments. Moodle will also be used for students to submit assignments (see next section). If you are not familiar with using Moodle, please see me as soon as possible.

Turning in Assignments

All assignments should be submitted to either Dr. Archer by **6pm** the day of the assignment due date.

Cell Phone/Laptop Policy

Cell phones should be kept out of sight and silent during the class period and during any field experiences.

Communications

Prior to traveling to Abaco, please use email to make an appointment to see Dr. Archer – I will try my best to accommodate your requested meeting time. I will respond to emails as quickly as possible. While on Abaco, you can simply approach me to speak, or send an email if you'd rather schedule a private meeting.

Coursework and Grading

Category	Grade %	Points
Self-Reflection (daily)	10%	100
Field Exams	25%	250
Pre-Course Reading Quiz	5%	50
Field Activities and Worksheets	10%	100
Mini Research Presentation	10%	100
Participation and Professionalism	25%	250
Final Project-Educational Pamphlet	15%	150
TOTAL	100%	1000

GPA	Range	GPA	Range
A	95-100%	C+	77-79%
A-	90-94%	C	73-76%
B+	87-89%	C-	70-72%
B	83-86%	D+	67-69%
B-	80-82%	D	60-62%

General Assignment Guidelines

Assignments should be submitted to Dr. Archer. Assignments received late may be penalized 10% (one letter grade) for each day of delay. This means that, should you hand in an assignment one week late, the highest possible grade you can receive is a 48%.

Self-Reflections

Reflections should be completed daily and will be hand-written in provided field books. The reflection is due by 6pm each day we are on Abaco. The field books will be returned to students each morning. The reflection should be a



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minimum of 1-page and center around questions such as the following: (note – each of these does not need to be answered, this is provided to guide your thoughts on the experiences and learning opportunities of the day).

- What surprised you today, and why?
- What is the most important thing you learned today? Why do you think so?
- What do you want to learn more about, and why?
- What made you curious today? What do you think sparked this curiosity, and what did it make you wonder about?
- What did you learn about or experience today that made you think about your own impact on the world or a change you could make to benefit your self/community/society?

Field Exams

Twice during the course, ~1 hr will be spent in a field setting in which the instructor will ask students to answer basic questions related to activities we completed in the field, and test overall field knowledge (e.g., the characteristics of red mangroves) and its application to ecosystem services. **Students will answer these questions individually.** Each exam is worth 12.5% of your overall grade (25% cumulative grade).

Field Activities and Worksheets

Handouts/Questions assigned by the instructor will be provided to small groups (3 to 4) for each field activity, oriented towards understanding ecosystem attributes, relevant species identification, ecosystem services, and impressions of the natural environment. It is the responsibility of each group to complete the field investigation & analysis (1 per group), and submit them to the instructors at the end of the day (by 8PM) unless otherwise instructed. Time will be built into each activity to sufficiently complete each handout.

Participation and Professionalism

Participation and professionalism are graded according to the rubrics provided on pages 5 and 6. The participation and professionalism grades are decided upon jointly by all instructors and are non-negotiable.

Final Project

The students will work in small groups (3 to 4) to produce educational material in the form of a newsletter, infographic, pamphlet, poster, etc. to disseminate to the community that demonstrates an understanding of the application of information or knowledge gained from the course. Examples include a poster detailing the impacts of single-use plastics on marine fauna or the effects of chemicals found in sunscreen on coral reefs.

University Policies

Religious Holidays

Accommodations will be made for religious holidays. Please let me know at least 24 hours in advance if you need to be absent for religious observance.

Academic Integrity

Learning is a privilege that demands responsibility. At LUMCON, students and faculty are members of an academic community that supports integrity both inside and outside the classroom. The expectation at LUMCON is that students



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will take advantage of the opportunity for intellectual development and, in doing so, will conduct themselves in a manner consistent with the standards of academic integrity. When these standards are violated or compromised, individuals and the entire LUMCON community suffer. Students who engage in acts of academic dishonesty will not only be reported to their University's office of Academic Affairs, but also may harm their future educational and employment opportunities.

In other words, don't bring unauthorized materials into exams, don't plagiarize someone else's work, and make sure that your collaborations are conducted in accordance with university and course policy. The best way to avoid a problem is to consult with your instructor before taking any action that might constitute a violation.

Plagiarism is a serious offense and includes:

- Copying text verbatim from sources without quotes and references. [Note: figures may be copied with attribution and your own text as a caption.]
- Adapting text from sources with minor modifications in language without references
- Copying concepts or information from other sources that you don't understand
- Appropriating ideas from other sources without proper attribution.

Accessibility statement

We all learn differently, and course design should not be a barrier to success. Similarly, we all have different experiences outside of the classroom that can make aspects of remote learning difficult. If any aspect of the course is not working for you, for any reason, please contact Dr. Archer (sarcher@lumcon.edu) or Murt Conover (mconover@lumcon.edu) as soon as possible.

Statement on Diversity and Inclusion

Science, in particular the natural sciences, has historically been the purview of a very small, privileged demographic group. The scientific enterprise has suffered because of this. Part of the goal of this course is to remove part of the "hidden curriculum" that places an invisible barrier between many minority students and success in STEM. Consequently, it is my sincere hope that students of all backgrounds and identities will feel welcome and valued in this course. If, for any reason, you do not feel comfortable, welcomed, or valued please reach out to me (sarcher@lumcon.edu) or Murt Conover (mconover@lumcon.edu) as soon as possible. If I can be a resource for you in any way, please do not hesitate to ask.

Dispute over grades

If you have any questions regarding a grade you received on an assignment, please feel free to contact me. If you would like to formally dispute your grade, please contact Murt Conover.