



**EESC04 – Biodiversity and Biogeography  
Winter 2022**

**Instructor:** Prof. Adam Martin ([adam.martin@utoronto.ca](mailto:adam.martin@utoronto.ca)).

**Teaching assistants:**

Mahendra Doraisami ([mahendra.doraisami@mail.utoronto.ca](mailto:mahendra.doraisami@mail.utoronto.ca)): **monitoring Quercus Tuesdays, 4:00pm.**  
Jennifer Powell ([jennifer.powell@mail.utoronto.ca](mailto:jennifer.powell@mail.utoronto.ca)): **monitoring Quercus Thursdays, 4:00pm.**

**Lectures:** Tuesdays 5-6pm, online synchronous (through Zoom; links provided on Quercus), with video and PDF of slides posted on the course Quercus page after lectures.

**Course consultation (primarily related to course readings and paper review assignments):**  
Tuesdays 6:00-6:30 pm, online synchronous (through Zoom) following lectures.

**Practicals:** None this term.

**Course readings:** Listed below.

**Course description:**

Biogeography is the study of the geographic distribution of species, and biodiversity is the study of species richness and relative species abundance. Through lectures and in-class discussions, this course explores the origin, maintenance, and loss of biodiversity, from a biogeographic perspective. The course aims to provide students with a broader understanding of what constitutes biodiversity, how it has come to be, and what geographic factors help explain and drive the patterns observed today.

The first half of the course will examine key themes within the sphere of biodiversity, including:

- i) Species concepts.
- ii) The number of species on Earth.
- iii) How biodiversity is distributed globally.
- iv) The value of biodiversity to humans.

The second half of the course then switches gears and evaluates key themes in the realm of biogeography including:

- i) Biodiversity changes across geologic time scales.
- ii) The major biomes of the world.
- iii) The Island Theory of Biogeography.
- iv) The SLOSS debate.
- v) The Anthropocene Epoch and the geological scale of human-caused extinctions.

**Course evaluation:**

Course Item	Due Date	Percent
What do we know, and what did we learn exercise	Jan. 14 <sup>th</sup> AND April 5 <sup>th</sup>	5%
Scientific paper reviews	See Schedule	10 * 7% = 70% total.
Final Exam (take home)	TBD	25%

**In-class content and schedule:**

Week	Date	Lecture topic	Related paper review	During this week
1	Jan. 11	Introduction to Biodiversity and Biogeography		<b>What do we know (Part 1)?</b>
2	Jan. 18	Species concepts and classification	Reading #1	
3	Jan. 25	How many species are there in the world?	Reading #2	
4	Feb. 1	The latitudinal diversity gradient	Reading #3	<b>*Paper Reviews 1-3 due Friday, 4:00pm.</b>
5	Feb. 8	Biodiversity and ecosystem function	Reading #4	
6	Feb. 15	Biodiversity through geologic time Pt. 1	Reading #5	<b>*Paper Reviews 4-5 due Friday, 4:00pm.</b>
	Feb. 22	<b>Reading week</b>		
7	March 1	Biodiversity through geologic time Pt. 2	Reading #6	
8	March 8	Biomes of the world	Reading #7	<b>*Paper Reviews 6-7 due Friday, 4:00pm.</b>
9	March 15	Island biogeography	Reading #8	
10	March 22	The SLOSS debate	Reading #9	
11	March 29	The Anthropocene and species extinctions	Reading #10	<b>*Paper Reviews 8-10 due Friday, 4:00pm.</b>
12	Apr. 5	Course review and final exam prep		<b>What did we learn (Part 2)?</b>

## Course readings

- Reading 1.** Zachos, F.E. (2016) An annotated list of species concepts. *Species Concepts in Biology*, pp. 77-96. Springer, Cham.
- Reading 2.** Mora, C., Tittensor, D.P., Adl, S., Simpson, A.G. & Worm, B. (2011) How many species are there on Earth and in the ocean? *PLoS Biology*, 9, e1001127.
- Reading 3.** Mittelbach, G.G., Schemske, D.W., Cornell, H.V., Allen, A.P., Brown, J.M., Bush, M.B. & McCain, C.M. (2007) Evolution and the latitudinal diversity gradient: speciation, extinction and biogeography. *Ecology Letters*, 10, 315-331.
- Reading 4.** Costanza, R., de Groot, R., Sutton, P., Van der Ploeg, S., Anderson, S.J., Kubiszewski, I., Farber, S. & Turner, R.K. (2014) Changes in the global value of ecosystem services. *Global Environmental Change*, 26, 152-158.
- Reading 5.** Zhang, X., Shu, D., Han, J., Zhang, Z., Liu, J. & Fu, D. (2014) Triggers for the Cambrian explosion: hypotheses and problems. *Gondwana Research*, 25, 896-909.
- Reading 6.** Benton, M.J. & Twitchett, R.J. (2003) How to kill (almost) all life: the end-Permian extinction event. *Trends in Ecology & Evolution*, 18, 358-365.
- Reading 7.** Ellis, E.C., Klein Goldewijk, K., Siebert, S., Lightman, D. & Ramankutty, N. (2010) Anthropogenic transformation of the biomes, 1700 to 2000. *Global Ecology and Biogeography*, 19, 589-606.
- Reading 8.** Santos, A.M., Field, R. & Ricklefs, R.E. (2016) New directions in island biogeography. *Global Ecology and Biogeography*, 25, 751-768.
- Reading 9.** Gilbert-Norton, L., Wilson, R., Stevens, J.R. & Beard, K.H. (2010) A meta-analytic review of corridor effectiveness. *Conservation Biology*, 24, 660-668.
- Reading 10.** Ceballos, G., Ehrlich, P.R., Barnosky, A.D., García, A., Pringle, R.M. & Palmer, T.M. (2015) Accelerated modern human-induced species losses: entering the sixth mass extinction. *Science Advances*, 1, e1400253.

## **Assignments and graded material in brief**

**What do we know, and what did we learn exercise:** This will seem like a pop quiz on week 1. Don't freak out. The goal of this exercise is to ask you a series of questions on biodiversity and biogeography on the first day of class, and then return to these questions and your answers on the final day of class. This is therefore designed to evaluate i) how familiar you are with major themes in biodiversity and biogeography, and then ii) how familiar you have become are with these same themes following this course. This learning approach complements the final exam, but addresses topics in a more broadly. Note that your grade will be based on i) your *efforts* to answer comprehensively on Week 1, and ii) your *technical correctness* on Week 12 of the course; in other words, you will not be penalized for being unfamiliar with the content on Day 1.

**Paper reviews (\*10):** The technical skills that EESC04 will largely focus on this term, are scientific literacy and academic writing interpretation. For each of the 10 course readings in EESC04, these paper reviews are an opportunity to: 1) summarize the key points on the readings; 2) dissect and identify the main goal, research questions, or hypotheses in scientific papers; and 3) devise and write out your own questions on a scientific topic, that were raised while readings these papers. Each paper review will entail completing a pre-defined set of questions (see “EESC04 2022 Paper review template” on Quercus), which are designed to allow students to teach students how to distill the key features of academic papers. Deadlines for these submissions are as follows:

**Readings 1-3: Friday, February 4<sup>th</sup>, 4:00pm EST sharp.**

**Readings 4-5: Friday, February 18<sup>th</sup>, 4:00pm EST sharp.**

**Readings 6-7: Friday, March 11<sup>th</sup>, 4:00pm EST sharp.**

**Readings 8-10: Friday, April 1<sup>st</sup>, 4:00pm EST sharp.**

Please note that these deadlines have been arranged, based on student feedback to online learning. Therefore, we hope you are able to work through these readings and assignments at a pace that suits your own personal and professional schedules.

**Final exam:** A comprehensive final exam covering the course material, though weighted heavily to the final half of the course, will be given during UTSC examination period worth 25% of your final grade. The final exam will consist of long answer questions, and will be based on both lecture and readings. The final exam will be distributed approximately 24 hours prior to the due date.

## **Course policies – written assignments**

**Late assignments:** Our due dates for course material are very liberal in EESC04. Therefore no late submissions will be accepted. Once the online portals for submissions are closed, there will be no opportunity for late submissions, unless arranged through AccessAbility Services.

**Plagiarism:** Plagiarism is a serious academic offence. Please read the faculty's guidelines on plagiarism. Do not hesitate to consult with your instructor or TA about strategies that you can use to avoid being accused of plagiarism. Please note that all of your assignments will be reviewed through Turnitin, which will compare your content to both published material, and material submitted by others in EESC04. Since all assignments in EESC04 are independent, peer-peer plagiarism represents a serious academic offense.

**Course website – Quercus:** EESC04 uses Quercus as its course website. To access the EESC04 website go to the U of T portal login page at <http://toolboxrenewal.utoronto.ca/>, and log in using your UTORid and password. Once you have logged in to the portal, look for your course modules where you'll find the link to the EESC04 course website.

**Email contact, office hours, and communication:** The course instructor will send out important course information on Quercus. Therefore all students are required to have a valid UTSC email address. You are also responsible for ensuring that your UTSC email address is set up and properly entered in the ROSI system. You may also email me questions about course material. I will make an effort to respond to you within 24 hours during weekdays. My responses will take longer during weekends because I deliberately remain offline. **Email should not be a substitute to online course time.**

**Accessibility Statement:** Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodation, please feel free to approach me and/or Accessibility Services Office as soon as possible. I will work with you and Accessibility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC Accessibility Services staff (located in S302) is available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416-287-7560 or [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca)).

**The Writing Centre:** The Writing Centre is a free service that provides support for teaching and learning through writing for all UTSC students. The Writing Centre provides service such as one-on-one consultation, drop-in hours, English language development and writing clinics. They are located in AC 210, in the Academic Resource Centre.

**Health and Wellness Clinic:** The Health & Wellness Centre has trained health professionals to provide medical, nursing, counseling, health promotion, and education services to University of Toronto Scarborough students. Any student with a current student card and a valid health card can use our services. They are located in the Student Centre, UTSC, SL 270.