Dinosaurs - ERTH 2401 – Course Outline for Fall 2021

Instructor: Dr. Michael Ryan, MichaelJ.Ryan@carleton.ca
Due to Covid restrictions, I do not have an on-campus office.

Teaching Assistant: Misha Whittingham, mishawhittingham@cmail.carleton.ca

Brightspace: The course will be delivered on-line through Brightspace. If you have difficulties connecting to Brightspace, please resolve these issues with the university (https://carleton.ca/its).

Lectures: ERTH 2401 will have two 80 minute lectures each week, Wednesday and Friday from 14:35 pm to 15:55 pm EDT/EST beginning on Wednesday, Sept 8, 2021. The last lecture will be on Monday, Dec. 8th, 2021. The lectures will usually be presented live, but these will be recorded and posted to the course Brightspace site later the same day.

Lecture Zoom Links: A recurring Zoom link for my lectures will be embedded into the Brightspace course page.

Please note that some lectures may be pre-recorded. Also, many lectures will have additional pre-recorded components or links to outside, on-line sources that will also be part of the course examination material.

If a lecture is be presented through a pre-recorded video (no live lecture by Dr. Ryan), you will be made aware of this fact through a class announcement e-mail that I will send out to all students at the start of each week. During classes when a guest lecture is presenting live, their lecture will typically start at the beginning of the class and my lecture for that class will be prerecorded. All this will be made clear each week in my weekly e-mail announcements.

Office hours: My office hours are by appointment Wednesdays and Friday, 1:00 pm to 2:00 pm. Office Hours for the Teaching Assistant, Misha Whittingham are Tuesdays from 11:00am to 12:00pm. Please contact us by e-mail to set up an appointment and you will be sent a zoom link.

Questions about the course or the lecture material should be emailed to MichaelJ.Ryan@carleton.ca. E-mailed questions will be responded to within 24 hours. Note that e-mails will only be responded to between 9:00 am to 5:00 pm EST/EDT, Monday to Friday.

Grade Breakdown:

There will be two midterms scheduled during a regular lecture time slot and a final exam scheduled by the university. There will be no quizzes. Due to the size of the course there will not be optional extra assignments.

Midterm 1: 30%, 80 minutes. Wednesday, Oct 6, 2021, 14:35 – 15:55 EDT (covers lectures 1 to 8)
Midterm 2: 35%, 80 minutes. Wednesday, Nov 10, 2021, 14:35 – 15:55 EST (covers lectures 9 to 15)
Final Exam: 35%, 2 hours TBA (covers lectures 16 to 23)

Note that midterm 2 and the final exam are *non-cumulative*. The midterms and final exam will be taken on-line through Brightspace. Questions on the mid-terms and final exam will consist of True & False, Fill in the Blanks, Matching & Labeling questions, and Short Answer questions. Early in the course, I will post examples of exam questions for you to attempt so that you can anticipate the types of questions that you will see on the midterms and the final exam. I also strongly urge you to study the topic questions at the end of each chapter as they will help you to focus on the important topics in each chapter and they may often form the basis of actual exam questions.

Midterms will be scheduled for 80 minutes and typically consist of 50 to 70 questions depending on their level of difficulty. The final exam is scheduled for 2 hours and will consist of 80 to 110 questions depending on their level of difficulty. Each midterm will be activated at the start of the scheduled class time slot (14:35 pm EDT/EST) and will close at the end of the class time slot (15:55 pm EDT/EST). Once you begin a midterm you cannot close the exam and restart it. Once you begin the midterm, it will close and automatically be submitted to Brightspace after 80 minutes. If you do not start the midterm at the start of the class period you will have less than 80 minutes to complete the exam. Although the final exam will be 120 minutes in length, similar start/end conditions will apply.

Be aware that you have enrolled in ERTH 2401 knowing when the classes are scheduled and are therefore expected to be available during those scheduled timeslots. All exams are closed book.

Valid excuses for missing a midterm and scheduling a make-up exam are for medical reasons or a death in the family, and must be documented with the appropriate a medical certificate or self declaration form (see the on-line section on Academic Accommodation). Other excuses are not valid. You must contact me within 24 hours of a missed midterm to inform me that you are requesting a make-up exam and will be providing me with documentation, otherwise you will not be eligible for a make-up exam. The make-up midterm must be taken within one week of the missed scheduled midterm. Requests for a deferral of the final exam must be made to the Registrar's Office who is the only authority that can authorize a deferral.

Course objectives

1. Identify the major events in the evolution of dinosaurs. (Remembering and Understanding)
2. Explain the importance of fossils for palaeoenvironmental interpretations. (Remembering)
3. Explain the position of dinosaurs in the evolutionary history of life and their development throughout the Mesozoic Era, including extinction theories. (Remembering, Analyzing and Understanding)

4. Distinguish dinosaurs according to the characters of fossil remains. (Remembering and Understanding)
5. Analyze dinosaur intraspecific and interspecific behaviour through time. (Remembering and Understanding)
6. Analyze dinosaur palaeobiology for each major group. (Remembering and Understanding)
7. Describe the non-dinosaur flora and fauna of the Mesozoic. (Remembering and Understanding).
8. Explain the importance of dinosaurs in culture and as a tool for educating about science. (Understanding)

Learning Outcomes:
By the end of this course, students will be able to:
1. Recall the anatomy of dinosaurs.
2. Describe and evaluate patterns of relationships between major dinosaur groups.
3. Describe key evolutionary events in the origin and radiation of dinosaurs.
4. Describe the inferred biology and behaviour of dinosaurs.

Required Reading:
The course textbook is: D.E. Fastovsky and D.B. Weishampel, 2021. *Dinosaurs, A Concise Natural History* (4th Edition). Cambridge University Press (ISBN 978-1-108-46929-6 (paperback); (ISBN 978-1-108-47594-5 (hardback). This textbook is mandatory for the course.

The textbook can be obtained through the Carleton Bookstore. Earlier editions of the textbook may still be available from other sources, but be aware that some information in those editions will be out of date. Examination material for the course will be derived from the textbook and the lectures (both my own and the guest lecturers), and well as any additional pre-recorded or on-line material that I post to Brightspace.

Lecture Topics and Dates:
The lectures are derived from, but diverge at times from, the textbook, and some lectures are not covered in the textbook. The relevant chapters for each lecture (where appropriate) will be stated at the start of each lecture, although only portions of some chapters may be covered in some lectures (chapter numbers follow the 2021 edition of the textbook). By the end of the course we will have covered almost the entire textbook, so reading ahead is encouraged and will help those of you without a strong background in biology and geology.

The lectures will be delivered, whenever possible, synchronously during the scheduled course hours, Wednesday and Friday, 14:35-15:55 Eastern Time Zone (EDT/EST). My lectures will be simultaneously recorded and posted on-line after the class. I will also be posting my PowerPoint slides for each lecture.

In addition to my own lecture, many classes will also feature a guest speaker (occasionally supplanting my lecture) lecturing on the subject material for that class, but focusing on their area of expertise. These guest speakers will be acknowledged experts in their research fields,

and unless otherwise indicated, these lectures will also be covered in the exams. Whenever possible I will also post the PowerPoint presentation for the guest lecturers.

Whenever possible, these guest lecturers will present live to class, but due to time zone differences or other commitments, some of these presentations may be pre-recorded. Some guest lecturers have yet to be determined at the time this syllabus is being written.

Before the first class of each week, I will send out an e-mail announcement informing students who the guest lecturers, if any, will be for the week along with a short bio for each person. Any changes from this syllabus for that week will also be noted in the e-mail announcement.

Please note that each lecture should be viewed and understood before proceeding to the next lecture. Each lecture will assume an understanding of the preceding lectures. Also note that I will be recording attendance for each lecture.

Lecture Outlines:
Note that lecture topics are subject to change, with some sub-sections possibly being deleted or moved to another lecture slot for time considerations.

Lecture 1 (Sept. 8): Introduction & Objectives: Course Introduction and Overview; Review of Geological time; Review of plate tectonics; What is a dinosaur? (Chapters 1 &2, in part)

Lecture 2: (Sept. 10): Fossils and fossilization: What is a fossil? How do fossils form? How do we know the age of a fossil (Law of Superposition; radiometric dates; fossil correlations) (Chapters 1 &2, in part)

Lecture 3 (Sept. 15): Evolution and Phylogenetics: Review of evolution; What is a species? Phylogenetic systematics; Cladograms and how they are constructed. (Chapter 3)

Lecture 4 (Sept. 17): Anatomy and Relationships: Vertebrate anatomy; Overview of Dinosauria and the key features of each major group. (Chapter 4)

Lecture 5 (Sept 22): Life Before The Dinosaurs: Origin of life; Burgess Shale; Origin and diversification of Fish (guest lecture by Dr. Matt Friedman); Spotlight on *Dunkleosteus*; From the water to the land (evolution of tetrapods); Spotlight on *Tiktaalik*; Spotlight on *Dimetrodon*.

Lecture 6 (Sept 24): The Life of Jurassic Park's Dino Hunter: World famous palaeontologist and Jurassic Park movie consultant, Dr. Jack Horner, will present a lecture on his career and research. There will be a moderated Q&A period after his talk. Field palaeontology and fossil preparation will be covered in pre-recorded videos.

Lecture 7 (Sept 29): Theropoda 1: The origin of the first dinosaurs; Spotlight on *Eoraptor*; Spotlight on *Coelophysis*; Tetanurae; guest lecture by Dr. Nizar Ibrahim, world expert on *Spinosaurus*. (Chapters 5 & 7, in part)

Lecture 8 (Oct. 1): Theropoda 2: Introduction to Coelosauria. Tyrannosauridae and *T.rex* biology by Dr. Eric Snively, expert on *T. rex* feeding mechanics; Ornithomimids. (Chapters 6 & 7, in part)

Oct 6 (Weds), 14:35 – 15:55 PM EDT, MIDTERM LECTURE #1 (covering lectures 1 - 8 only); 80 minutes; 30%

Lecture 9 (Oct. 8): Maniraptora & the Origin of Birds: Maniraptora; Oviraptors & *Anzu* guest lecture by Dr. Matt Lamanna; *Archaeopteryx*, Feathers, wings and the origin of flight. (Chapters 6, 7 & 8, in part)

Lecture 10 (Oct. 13): Sauropodomorpha: Origin and biology of sauropods. Guest lecture by Dr. Kristi Curry Rogers on sauropod palaeohistology and dwarf sauropods. (Chapter 9)

Lecture 11 (Oct. 15): Thyreophora: Thyreophora origins; Ankylosaurs and Stegosaurs. Guest lecture by Dr. Susie Maidment on stegosaurs. (Chapter 10)

Lecture 12 (Oct. 20): Marginocephalia: Pachycephalosauria and Ceratopsia. Guest lecture by Dr. David Evans on pachycephalosaurs; Spotlight on *Aquilops*; Spotlight on *Torosaurus* and *Triceratops.* (Chapter 11)

Lecture 13 (Oct. 22): Ornithopoda: Basal ornithopods; Hadrosauridae; Spotlight on *Parasaurolophus*. (Chapter 12)

FALL BREAK OCT. 25 – 29, NO LECTURES. However, Dr. Ryan plans to host a 'non-mandatory attendance' virtual dino-movie night on an evening to be determined over the break. Bring your popcorn and chat with the special guest experts providing a running commentary on the movie to be chosen by your votes from the options available through Carleton Library's 'Films-On-Demand' site.

Lecture 14 (Nov. 3): Dinosaur Metabolism and Biology: Endothermy vs. ectothermy; Guest lecture on dinosaur palaeohistology by Dr. Mateus Wosik; Spotlight on the bat-wing dinosaur, *Yi qi* from China. (Chapter 13 & 14, in part)

Lecture 15 (Nov. 5): Dinosaur Behaviour: How do we infer behaviour? Parental care and nesting behaviour (guest lecture by Dr. Danny Barta); Tyrannosaurid herding behaviour; How to make a fossil trackway. (Chapter 6, in part)

Nov. 10 (Wednesday, 14:35 – 15:55 PM EST, MIDTERM LECTURE #2 (covering lectures 9 - 15 only), 80 minutes; 35%

Lecture 16 (Nov. 12): In The Shadow of The Dinosaurs: Mesozoic plants (spotlight on the palynology of Dinosaur Provincial Park); Mesozoic amphibians; Pterosaurs; Marine reptiles (Chapter 15 for plants)

Lecture 17 (Nov. 17): Palaeoecology & Taphonomy: Cretaceous palaeoecology guest lecture by Dr. Jordan Mallon; Taphonomy guest lecture by Dr. Ray Rogers (how to bury a *Velociraptor* in the Gobi desert); Reconstructing fossil communities from microsites.

Lecture 18 (Nov. 19): Exploration and Discovery: Early history of palaeontology; Spotlight on Mary Anning; Guest lecture on Roy Chapman Andrews and the Central Asiatic (Gobi) Expeditions of the American Museum of Natural History by palaeontologist and historian, Clive Coy. (Chapter 16)

Lecture 19 (Nov. 24): Dinosaurs of Canada: Overview of Canadian dinosaur localities; Dr. Ryan talks about his Southern Alberta Dinosaur Project that has discovered and named more than a dozen new dinosaurs in the past 15 years.

Lecture 20 (Nov. 26): Dinosaurs Around The World: Dinosaur palaeobiogeography in the Mesozoic - who was where when; Dinosaurs of Africa; Alaskan dinosaurs.

Lecture 21 (Dec 1): The Rise & Fall & Rise of the Dinosaurs: Dinosaurs at the end of the Cretaceous – guest lecture by Dr. Denver Fowler on the Hell Creek Formation of Montana. Guest lecture by Dr. Alessandro Chiarenza on 'What Killed the Dinosaurs' (Chicxulub asteroid impact vs. Deccan traps)? (Chapter 17)

Lecture 22 (Dec. 3): Dinosaurs, Science & Culture: Writer and artist Stephen Bissette moderates a panel on the evolution of dinosaurs in (pop) culture and how that culture helped to shape the science of dinosaur palaeontology. Industrial Light & Magic CGI artist Andreas Feix presents the history of cinematic dinosaurs and how he builds and animates dinosaurs for *Jurassic Park*. NYTs best-selling author, Dr. David West Reynolds, recounts how he and Dr. Ryan once found the actual remains of the *Star Wars* Krayt Dragon in Tunisia.

Lecture 23 (Dec. 8): Dinosaurs & Science Communication: Dr. Scott Sampson, CEO of the California Academy of Sciences (aka 'Dr. Scott' form PBS's 'Dinosaur Train' series) presents a guest lecture on how dinosaurs can be used to communicate science and what cautionary tales from the Reign of the Dinosaurs can tell us about the environmental extremes the world is currently experiencing.

FINAL EXAM: TBA, (<u>covering lectures 16 -23 only</u>), 2 hours; 35%

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation, or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, contact your instructor as soon as possible to ensure accommodation arrangements are made. **carleton.ca/pmc**

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: **carleton.ca/sexual-violence-support**

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience.

Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. **https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf**

For more information on academic accommodation, please contact the departmental administrator or visit: **students.carleton.ca/course-outline**

Academic Integrity

The University demands, unequivocally, academic integrity from all of its members, including students. Misconduct in scholarly activity will not be tolerated. The integrity of a student's academic work is critical to enabling student success. Students who violate the principles of academic integrity undermine the quality of their education and the value of a Carleton University degree.

Plagiarism and other forms of misconduct will not be tolerated. It is the student's responsibility to read and understand the university's Academic Integrity Policy which can be downloaded from here: **https://carleton.ca/registrar/wp-content/uploads/Academic-Integrity-Policy.pdf**