SCHOOL OF BIOLOGICAL, EARTH AND ENVIRONMENTAL SCIENCES

FACULTY OF SCIENCE

UNSW SYDNEY

GEOS3761
ENVIRONMENTAL CHANGE

Term 2, 2022

Information about GEOS3761

Dr Heather Haines is the *Course Convener* and should be the first point of contact for any issues. Dr Haines' office is on Lower Campus in the Hilmer Building (E10), Room 539. You can reach her by email at h.haines@unsw.edu.au – please try and remember to put GEOS3761 in the title of your email so that she knows your email is about this course. This year we will not be holding set office hours but you are welcome to email and book an appointment to discuss any issues around the course – appointments can be virtual or in person (following the COVID safety protocols below). Dr Haines will be providing your lectures for Weeks 1-5, and 9-10 and practicals for Weeks 1-3, 5, and 7-10. All queries around assessments and marking should be addressed to Dr Haines. For more information about Dr Haines you can check out her BEES webpage here https://www.unsw.edu.au/staff/heather-haines

Dr Zoë Thomas, an ARC DECRA Fellow in the School of BEES, will present your Week 4 practical as well as the lectures in Week 8. Learn more about Dr Thomas and her research here https://www.unsw.edu.au/staff/zoe-thomas We will also have guest lectures in Week 7 from Dr Haidee Cadd a Postdoctoral Research Fellow at the University of Wollongong.

This year GEOS3761 will be delivered as a blended course. The content will be provided through weekly online lectures as well as face-to-face practicals held on Fridays from 10am-noon in the Law Building Room 162. It is recommended that you watch the online lectures and any practical pre-learning prior to attending he weekly practical. The only exception will be the Week 5 practical which will also be held online. There is also a Moodle Discussion Forum which provides an opportunity for you to engage with everyone on the course. Please feel free to post any questions or discussion ideas you would like as Dr Haines will be checking Moodle regularly. You are also encouraged to answer each others questions and to engage in discussion with your fellow students.

Course Description	Environmental change occurs over all temporal and spatial scales and influences the atmosphere, climate, landforms, soils and vegetation. This course will explore: Evolution of the Earth system; Modelling and impacts of past, present and future environmental change; Humans as part of the environment; Human impact on the atmosphere and climatic consequences; Impacts of natural changes on human populations; and Techniques for environmental reconstruction and dating the past.
Aims of the Course	In the course Environmental Change, anthropogenic environmental change and human responses will be placed in the context of natural processes. Drawing on examples from extreme events and long-term changes, we will look at how past and contemporary processes can help the world achieve the UN SDGs in the next decade. Underpinning this course will be the scientific methods and implications for the future. This course will hone your critical thinking, developing a wide range of skills and capabilities that are transferrable beyond a career in science.
Student Learning Outcomes	By the end of this course, you will have an appreciation of environmental change over a variety of timescales, ranging from ice ages and superinterglacial warming, to contemporary interactions between humans and

	the natural world, and their value in managing future change. Emphasis is placed on understanding the various techniques for the reconstruction of past environmental change. The blended delivery will investigate current issues within the discipline, leading to an appreciation of the complexity of contemporary challenges the world faces. The assessments will help develop your ability to read the landscape and communicate your findings to the public. GEOS3761 emphasises critical thinking, and the application of environmental research to decision and policy making. Specific learning outcomes for GEOS3761 are: 1. Demonstrate leadership through interpreting and communicating applied knowledge to specialist and non-specialist audiences; and 2. Analyse critically, reflect on and synthesise information to solve complex problems; and 3. Demonstrate an advanced understanding of the causes and impacts of past environmental change, and implications for the future.
Course Structure	GEOS3761 aims to introduce key events in our planet's history. This course is delivered over ten weeks. Each week we will be exploring past and contemporary environmental events through a mixture of lectures, short films, virtual tours, and discussion supported by practicals. The key texts for each session are provided on Moodle. Do please pay close attention to announcements on Moodle. There will be weekly updates on what we will be covering in the course. You will receive important announcements in regards to the course that will be sent to your UNSW email address (so forward this to whatever email account you use regularly). The hybrid course layout provides flexibility for your learning, which is especially helpful if you are juggling studying with employment and other responsibilities. But if you can't make any face-to-face session, please contact Dr Heather Haines to discuss your options. Importantly, there is no exam for GEOS3761. Instead, you will be undertaking assessments through the course that will support your learning (see below).
A Note on the Practicals	Practicals are designed to work on skills and to discuss conceptually difficult or larger issues associated with the course. In the past most students have found the practicals to be intellectually stimulating and fun but they may require some preparation so that you can participate in the discussions – please pay attention to the Moodle announcements in regards to when preparation work is required. COVID-safe practices will be implemented for the practicals. All students will need to complete the BEES Face-to-Face Code of Conduct which you can find on our Moodle page. Some important notes from this is that students MUST WEAR A MASK AT ALL TIMES DURING FACE-TO-FACE LEARNING. All shared equipment will be wiped down for your safety prior to class and again at the end of the class. Please be advised that our practicals are not laboratory assessments to lab coats will NOT be required in this course. It is important that you attend the weekly practicals as all assessments will be explained and reviewed during these times. Some of the assessments will involve activities that take place during the practicals.

Graduate Attributes Developed in this Course		
Attribute	*0 = NO FOCUS* *1 = MINIMAL* *2 = MINOR* *3 = MAJOR*	**Activities/Assessment**
Research, inquiry and analytical thinking abilities	3	An ability to illustrate and discuss the contested and provisional nature of knowledge and understanding; an ability to critically evaluate a diverse range of specialised techniques and approaches involved in collecting geographical information; an ability to identify, acquire, critically evaluate and synthesise data from a range of sources; an ability to use dates and ages to effectively and appropriately to understand past change; an ability to effectively and appropriately interpret and use numerical information; and an ability to reflect on the process of learning and evaluate personal strengths and weaknesses.
Capability and motivation for intellectual development	3	A critical understanding of a diverse range of approaches to the generation of knowledge and understanding across various geo-, bio- and environmental science disciplines; and an understanding of the nature of change within physical environments.
Ethical, social and professional understanding	2	An understanding of reciprocal relationships between physical and human environments; contemporary environmental issues considered with respect to past environmental change; and an understanding of the significance of time on physical and human environments.
Communication	3	An ability to communicate ideas, principles and theories effectively and fluently by written means; an ability to describe, apply and evaluate the diversity of specialised techniques and approaches involved in analysing geographical information.
Teamwork, collaborative and management skills	3	An ability to undertake individual and group learning (including time management, library resource use and website investigation) to achieve consistent, proficient and sustained attainment.
Information literacy	3	An ability to develop a sustained and reasoned argument; and an ability to formulate and evaluate questions and identify and evaluate approaches to problem-solving.

Relationship to Other Courses

Environmental Change is a 6 units of credit (UOC) Stage 3 course and contributes to the Geography Major in Science (3970), the Physical Geography Major in Advanced Science (3972) and to the Environmental Science (3988) and Environmental Management (3965) programs at UNSW. The course has synergies with biogeography, palaeoclimatology and climatology, Quaternary Science, other geo- and environmental sciences and palaeoanthropology and archaeology. Nonetheless, the course is designed to be accessible to all upper level students.

Rationale and Strategies Underpinning the Course

The learning and teaching rationale underpinning the course draws on of the following concepts:

- Learning is best achieved where students undertake a variety of tasks (reading, writing, discussing) and particularly those that stimulate higher-order thinking such as analysis, synthesis and evaluation. A variety of teaching methods and modes of instruction are employed in GEOS3761. Higher-order thinking is encouraged in GEOS3761 via interactive lectures, through discussion in the practical classes where questions and critical thinking are encouraged, and via the assessment tasks.
- The learning experience is also enhanced through the use of activities that are interesting and challenging. Students are more engaged in the learning process when the relevance of the material to professional, disciplinary and/or personal contexts is obvious. In GEOS3761 past environmental change is considered in the context of contemporary and possible future anthropogenic environmental alteration, making it relevant to all undertaking the course.
- GEOS3761 aims for an inclusive learning and teaching experience, creating a community of learners: dialogue is encouraged via discussion, (initial) group work and through the use of discussion/posts on Moodle.

WHS in GEOS3761

There are relatively few WHS issues associated with this course. Nonetheless, students should be aware that the BEES WHS site (http://www.bees.unsw.edu.au/health-andsafety) contains important information relating to workplace safety, including Covid-19. This information complements that which can be obtained from the UNSW WHS website (http://www.ohs.unsw.edu.au).

Student Support

The University offers a wealth of resources to support you during your time with us. You can find out more at Student Support (https://student.unsw.edu.au/advisors). These resources include the Learning Centre which offers help to develop and refine your academic skills, advice with personal and health issues (https://student.unsw.edu.au/ educational-support-advice-personal-and-health-issues), and IT-related issues including remote access (https://www.myit.unsw.edu.au/services/students).

Equity and Diversity

Those students who have a disability that requires some adjustment in their learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with Equitable Learning Services who offer virtual drop-in sessions (http://www.studentequity.unsw.edu.au/; email: els@unsw.edu.au). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Please let us know in Week 1 if you have any specific learning needs. Early notification is essential to enable any necessary adjustments to be made.

Grievance Policy

The UNSW Student Complaint Procedure is located at https://www.gs.unsw.edu.au/policy/documents/studentcomplaintprocedure.pdf and the procedure for the resolution of complaints about student experiences at the University is located at https:// student.unsw.edu.au/complaints.

In all cases you should first try to resolve any issues with the course convenor Dr Heather Haines. If this is unsatisfactory, you should contact the School Grievance contact who is our Deputy Head of School, A/Professor Scott Mooney (s.mooney@unsw.edu.au). Director of Teaching and Learning in BEES Associate Professor Stephen Bonser (s.bonser@unsw.edu.au). The University Counselling Services can also offer support (Tel.: 02 9385 5418 or email: counselling@unsw.edu.au).

Recommended Text, Reading and Resources

There is no set text in GEOS3761. GEOS3761 covers a wide range of disciplines and material, considering past, contemporary and potential future environmental change. It is essential to regularly do some reading for this course. A number of scientific journals publish the latest findings in past environmental change, most of which you will find in the library with past copies online. Ask the librarians for guidance if any problems. Some key journals to get to know are:

Nature
Science
Nature Geoscience
Nature Communications
Scientific Reports

Excellent papers on 'hot' (current) topics can be found through leafing through the contents pages of these major science journals. By clicking on the links above you can search the titles and abstracts. If you wish to access the pdfs of the papers you will need to login via the university library system. Relevant papers also appear in a wide spectrum of other scientific journals, depending upon the topic covered. If you have not yet done so, find out where the above can be accessed (past and current issues). If you are not already familiar with the Library's browsing and electronic search systems, please seek the assistance of the librarians and ensure you know how to search topics and/or authors. This is an invaluable way of seeking out those helpful and crucial sources that may lay the foundation for a deep understanding of the course.

To support your reading, New Scientist is recommended for an overview of recent developments in scientific understanding. For podcasts, Nature and Science offer summaries of the key scientific findings published in their weekly issues. For an up-to-date view on climate change with regular contributions on the value of the past we highly recommend the excellent and accessible website www.realclimate.org.

If you do use web-based resources, please remember that not all sources are provided by reputable (scientific) sources. Unfortunately, there are a number of highly-visited sites that are maintained by individuals with limited scientific training.

You should check the dedicated pages for GEOS3761 in Moodle regularly: all course handouts, lecture materials, resources and announcements will be managed using this resource. Class members

are strongly encouraged to use the dedicated discussion areas to solve any issues associated with the course.

What is Expected From You

If you read the suggested texts and understand them thoroughly, this will provide an excellent background for the module. To be awarded a High Distinction you will need to provide evidence of wider reading of the subject. Excellent answers show evidence of familiarity with specialist literature.

As a guide, the UNSW Academic Board suggests that a normal workload for a 6 UOC course is approximately 9.4 hours per week (including class contact hours, time spent on assessable tasks and preparation/reading).

Guide to Studying

The world is experiencing a worrying amount of environmental changes and as a result, scientific study across the many fields is vast. It is all too easy to lose track of your reading when you consider all the scientific papers, reports, magazine and books on the subject. We will guide you as best we can but the main thing is to engage with as much reading as you can on the topics being covered, and explore the concepts with your fellow students and teaching staff.

GEOS3761 resources will be suggested during lectures and practicals with key texts available on Moodle. These are just to get you started so you will need to use these to find other articles and books. Google Scholar and Scopus are excellent resources for searching who is citing what.

As you have hopefully now started to realise, it is not the aim at university level to provide comprehensive notes for students to copy verbatim that cover the entire syllabus. Apart from being an impossible aim for a subject as vast as environmental change (and indeed for any other subject examined at university level), such an approach tends to stifle your thinking and development. Rather, we will be using the contact hours to introduce, develop and debate ideas. We hope you'll develop a background in theory by reading the relevant core materials and associated articles you may find, and joining us in group discussions. This is crucial for developing as an independent, critical thinker as you wrestle with a generation-defining topic.

Course Assessment

The assessment of GEOS3761 comprises three parts. Details are provided on Moodle.

Description	%	Due by…
Writing Scientific Reports: **- 2x science communication articles in the style of The Conversation** **- 1x laboratory report**	**45**% (15% each)	5pm Friday June 24th (Week 4) 5pm Friday July 22nd (Week 8) 5pm Friday July 29th (Week 9)
Techniques of Paleoenvironmental Study: **- Written Report on 1 technique that you chose to focus on**	**35**% (25% written report,	Written Report = 5pm Friday July 8th (Week 6)

- Reflections on 3 other techniques	10% reflections)	Reflections = 5pm Friday August 5th (Week 10)
A 3-minute scientific video on your paleoenvironmental technique	**20%**	5pm Friday July 29th (Week 9)

1. Please note, there is NO exam. And any quizzes on Moodle are NOT assessed. The latter are provided to support your learning.

2. The written report for your Technique of Paleoenvironmental Study is due on the Friday of Flexibility Week (Week 6). You are more than welcome to submit this assignment prior to Flexibility Week should you choose – the portal for online submission will be available starting in Week 3.

3. It is School policy that penalties will be deduced for the late submission of work (at 10% of the assignment mark for every day late – up to a maximum of 7 days after which the assignment will receive 0). Work will only be accepted after the end of Week 10 if accompanied by a medical certificate. Please follow the instructions on Moodle if you wish to apply for Academic Consideration.

4. To pass GEOS3761 a satisfactory performance is required in all components of the assessment. This means that all components of the assessment must be attempted. Unsatisfactory performance in any component may result in an UF grade ("unsatisfactory performance in an essential component of a course") even if your marks exceed 50%. The Assessment Rubrics for GEOS3761 are provided on Moodle.

5. Academic misconduct is sadly on the rise and will not be tolerated in any form in this course. If not yet done so, you should familiarise yourself with what constitutes plagiarism and the repercussions when caught. Further details are provided below and through the course page on Moodle (including important online resources).

Assessment Tasks and Feedback

The assessment criteria for each of the assessment tasks will be discussed in the practicals. Students should be aware that the assessment of the major assignment may not be finalised until the examination period.

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.
*Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and

- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:
- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne.

Course Evaluation and Development

Student feedback is gathered regularly in GEOS3761 by various means, including 'myExperience'. Such feedback, together with comments and discussion on Moodle and in classes really do help so please be as constructive as possible. This feedback has greatly helped to shape and develop the course for the better. If you do have any ideas with a view to improving the course please do feel contact the course convenor or initiate a discussion on Moodle.

Learning Program

Environmental change is a truly interdisciplinary subject. Each week we will be introducing new topics that aims to scaffold your learning to understand contemporary and future environmental changes. But we don't want you to drown in reading so have selected a limited number of key texts for each topic and these are provided on Moodle. **Lectures are provided online** for you to access anywhere, anytime. **Face-to-face practicals take place each week on Fridays from 10am-noon**. The course has an online Discussion Forum on Moodle that offers the chance to exchange ideas and ask questions through the ten weeks.

Course content will be released prior to the Week in which it is required with an introduction to each weeks content made the Friday prior. It is important to note that there are assignments throughout the course so don't lose sight of what needs to be done each week.

It is recommended that you view the lectures prior to attending the practicals every Friday. For the practicals you will sometimes require a computer to complete the exercises – you will be informed of this in the weekly introductions.

Summary for GEOS3761 2022

Week	Lecture Online	Practical Friday 10am – noon Law Building Room 162	Tasks and Assignments
1	May 30th – June 3rd Introduction to Environmental Change Timescale Perspectives of Environmental Change The Anthropocene	June 3rd Big Questions in Environmental Change? What is an Environmental Proxy? Introduction to Assignments	
2	June 6th – June 10th CO2 and Greenhouse Gas and Global Climate The Last Millennium Earth's Future at 2°C	June 10th Climate Forcing Factors and Drivers of Change Uniformitarianism vs Catastrophism	
3	Jun 13th – June 17th Glacial / Interglacial History The Last Interglacial The Holocene	June 17th Deep Ocean Coring; The IODP Forams and Oxygen Isotopes	
4	June 20th – June 24th Dendrochronology Chronology Building Dating Methods	June 24th (Dr Zoë Thomas) The Last Australian Ice Age	**Conversation Article #1 (15%)** due before 5pm Friday June 24th
5	June 27th – July 1st Abrupt Climate Change Flooding Megadroughts	June 27th – July 1st (**online this week**) Chronos 14Carbon-Cycle Virtual Lab Tour	
6	**Flexibility Week no lectures or practicals**		**Written Report on a Technique of Paleoenvironmental Study (25%)** due before 5pm Friday July 8th
7	July 11th – July 15th (Dr Haidee Cadd) Fire	July 15th Dendrochronology Laboratory Day 1	
8	July 18th – July 22nd (Dr Zoë Thomas) Tipping Points	July 22nd Dendrochronology Laboratory Day 2	**Conversation Article #2 (15%)** due before 5pm Friday July 22nd
9	July 25th – July 29th Human Colonization of Sahul and the Pacific Easter Island Societal Collapse Megafaunal Extinction	July 29th Human Environmental Interactions in Australia Video Screening: Sun Come Up	**Technique Presentation (20%)** due before 5pm Friday July 29th **Dendrochronology Laboratory (15%)** due before 5pm Friday July 29th
10	August 1st – August 5th UN Sustainable Development Goals Nature-Based Solutions to Environmental Change Societal Change	August 5th Rates of Change – Is the Anthropocene Unprecedented? The Lessons we can take from the Past	**Reflections on other Paleoenvironmental Techniques (10%)** due before 5pm Friday August 5th