THE UNIVERSITY OF

NEW SOUTH WALES

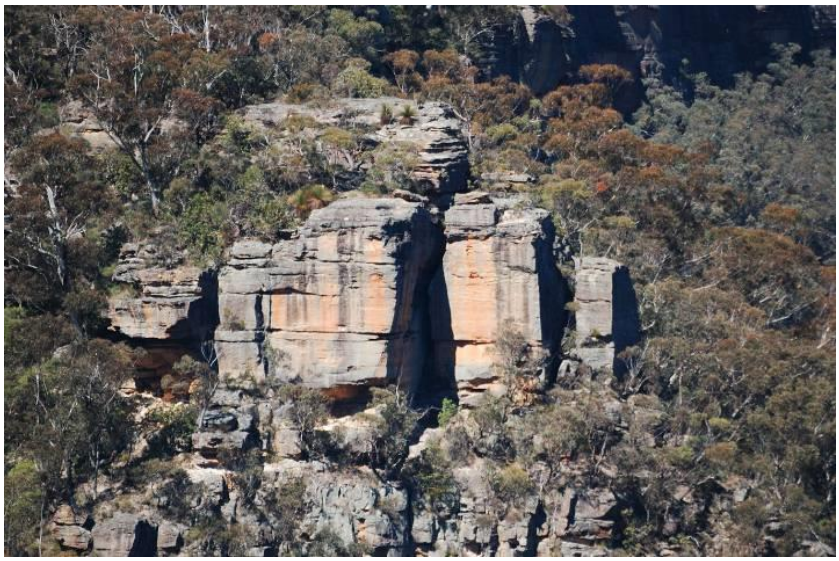
SCHOOL OF BIOLOGICAL, EARTH

AND ENVIRONMENTAL SCIENCES

GEOS1211

Environmental Earth Science

(6 UOC)



OUTLINE

2016

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2 INFORMATION ABOUT THE COURSE

2.1 GENERAL

Year of Delivery	2016
Course Code	GEOS1211
Course Name	Environmental Earth Science
Academic Unit	School of Biological, Earth and Environmental Sciences
Level of Course	1st year undergraduate
Units of Credit	6
Session(s) Offered	S2
Assumed Knowledge	
Hours per Week (HPW)	4 hours
Number of Weeks	12 weeks
Commencement Date	Monday 25 July 2016

Summary of Course Structure (more details under 3 Course Schedule)				
Component	HPW	Time	Day	Location
Lectures	**2**			
Lecture 1		12-1pm	Mon	Matthews Theatre B
Lecture 2		2-3pm	Fri	Matthews Theatre B
Practicals	**2**			
Lab		9-11am	Tues	Room G12, Biological Sciences Building
Lab		12-2pm	Tues	Room G12, Biological Sciences Building
Lab		3-5pm	Tues	Room G12, Biological Sciences Building
Bathurst Fieldtrip	2 day 29 Sep – 30 Sep	**The field trip is compulsory and will involve costs to students.** It involves walking some distance from the bus, and on sand or rocks, and is therefore difficult if you are on crutches. You should bring your lunch on the first day, wear boots and bring suitable gear for fieldwork (sunglasses, rain coat, sun block, hat etc.) as well as your hand lens, camera and notebook.		

Lab equipment needed	**Hand lens, magnet and pocket knife (recommended):** Most students in first year geology **should** have purchased one 10x hand lens before Week 2. You will also need a small pocket knife to test the hardness of rocks [however note that you are only allowed to carry the pocket knife when you are going to the lab] and a magnet to test the magnetic properties of minerals and rocks. They are available for purchase from the Pharmacy Shop G039, Quadrangle Building (Map Reference E15, Phone 9385 7617). **Covered shoes:** All students must wear covered shoes in practical classes in G12.

2.2 COURSE DETAILS

Course Description (Handbook Entry)	This course takes a modern approach to studying the history of change on planet Earth. The origins of the continents, oceans, atmosphere and the planet itself are considered. The beginnings of life and evolution of selected fauna and flora are investigated from genetic and fossil evidence. The relationships between Earth's geological environments and their associated life forms are explored. The effects of change both natural and induced by humans on soil, water and the landscape are examined. The tools required for the investigation of Earth's environments are introduced. Skills in environmental earth science will be acquired through problem solving laboratory tutorials and a 1-day field trip. The course is delivered by experts from across the range of earth and environmental sciences.
Course Aims	In the first part of the course the focus is on learning and understanding the evolution of the Universe, the Solar System and planet Earth. This leads onto the module on what makes up the lithosphere, how it was formed and the theory of plate tectonics and mountain building. The study of intrusive (plutonic) and extrusive (volcanic) rocks and associated minerals is studied next. The focus here is primarily on differentiating between basalts and granites and understanding their spatial extent and distribution. Students are also introduced to the history and significance of sedimentary rocks in the context of the formation of the Sydney Basin. In the second part of the course, the processes involved in the formation of the pedosphere (i.e. soil) are studied. This includes, understanding of the physical, chemical and biological weathering of rocks (i.e. consolidated and unconsolidated) and minerals as a function of interactions with other geospheres (e.g. biosphere, atmosphere and hydrosphere). In this section the land degradation issue of soil salinisation is also introduced along with its management. During the course students will be introduced to new methods of remotely sensed data acquisition and applications in geological mapping and natural resource management. This includes the theory of electromagnetic induction, gamma ray spectrometry and hyperspectral image analysis. In addition, the discipline area of palaeontology is introduced along with biological extinction events. The main aim of the course is to introduce theoretical concepts which will be reinforced by field and laboratory based work, enabling students to develop skills in describing and interpreting Earth surface processes, landforms, surface deposits and soils.
Student Learning Outcomes	Fundamental principles → Data collection → Data interpretation → Environmental management *Acquisition of knowledge* → *Application of theory* → *Application to practice* → *Communication to others* Laboratory and field work will provide practical skills in a range of geological, geomorphological and soil laboratory methods. The course also emphasises the development of: • Project planning and management, including data collection and interpretation • Group working, co-ordination and delegation The various assignments will test the knowledge and understanding of geological processes, palaeontology and pedology in the surficial environment, with a focus on landforms and the processes that shape them. Practical skills in conducting field work, laboratory tests and data analysis will also be developed and tested in the course, as well as writing skills at communicating the results. The course will emulate the type of professional activities that students might be expected to undertake on graduation.

2.3 KNOWLEDGE, UNDERSTANDING AND SKILLS

This course covers the essential fundamentals for any course in the broad earth sciences, environmental sciences and engineering fields. The following lists the main topics covered in this course.

PLANETARY GEOLOGY & EVOLUTION

Galaxies; stars, evolution of the solar system; extra-terrestrial objects; evolution of the Earth's crust and atmosphere; plate tectonics.

SEDIMENTARY GEOLOGY

Importance of sedimentary geology; what are sediments; how do sediments form; weathering and erosion; the water table.

THE SYDNEY BASIN & LACHLAN FOLD BELT

Economic importance; environmental considerations; evolution; major units; sedimentary features; mineral deposits

IGNEOUS PROCESS & ROCKS

Magma/lava; volcanic activity; igneous rocks; igneous structures; volcanic landforms; soils formed in volcanic landforms.

ROCK AND MINERAL WEATHERING

Physical and chemical weathering: what is chemical/physical weathering, why does it occur, what are some of the products, examples in the Sydney Basin and Lachlan Fold Belt (LFB).

GEOCHEMISTRY

Chemistry basics; isotopes; precipitation/dissolution; geochemical classification of rocks; geochemical controls on geological processes; geochemical variations in the crust; Goldschmidt's rules; geochemistry of soil, ice, and water; analytical techniques.

BIOGEOGRAPHY

History; contribution to society; major discoveries; biogeography in practice; classification; areagrams.

HUMAN ORIGINS AND ARCHAEOLOGY

Human evolution; genetics; comparison between primates; early Hominins; global spread; tool use; significant archaeological finds; the Stone Age.

PALAEONTOLOGY

What is extinction – not what most think. Why does it happen so often & why is it important for life? When & why mass extinctions occurred? Overview in brief – sum of the big Five Closer look at the 5th @ 65.5 Ma; Heated debates re human causation of 'Megafaunal' extinctions at the end of the Pleistocene. What should/could we be doing to slow the onset of the 6th Mass Extinction? Evolution of Australian organisms.

NATURAL HAZARDS

Volcanoes; tsunamis; eruptions; hazards; describing tsunamis; causes of tsunamis; large events; is Australia safe?

EARTH SCIENCE IN THE NEWS

A scientific understanding of current earth & environmental topics in the news, e.g. coal seam gas.

2.4 GRADUATE ATTRIBUTES DEVELOPED IN THIS COURSE

Science Graduate Attributes	Level of Focus (0 = no focus; 1 = minimal; 2 = minor; 3 = major)	Activities / Assessment
1. Research, inquiry and analytical thinking abilities	3	Design, conduct and interpretation of results of field and laboratory work
2. Capability and motivation for intellectual development	2	Real life investigative project.
3. Ethical, social and professional understanding	3	Role of palaeontology, geomorphology, geology, biogeography and pedology in describing and understanding natural resources and application of knowledge to environmental sustainability and natural resource management
4. Communication	2	Quizzes on laboratory work and field trip
5. Teamwork, collaborative and management skills	3	Laboratory work and field trip
6. Information literacy	1	Use the library, Moodle course material and the net to supplement material provided in lectures and practicals.
Other attributes	Geosciences often involve dealing with uncertainty due to the absence of key pieces of data. Students are introduced to this through the fieldtrip and discussions in the lectures.	
Relationship to other courses within the Program	This course is a recommended prerequisite within the Earth Science Programme. The course is complementary with: GEOS1111 – Fundamentals of Geology GEOS1701 – Understanding Physical Environments and Issues It provides a solid foundation for all second year geoscience courses, mining engineering and environmental earth science courses, including: GEOS2181 – Earth Materials GEOS2131 – Field Methods & Mapping GEOS2071 – Life Through Time GEOS2291 – Earth's Interconnections GEOS2721 – Australian Surface Environment and Landforms	

2.5 RATIONALE AND STRATEGIES UNDERPINNING THE COURSE

Rationale for learning and teaching in this course, i.e., How this course is taught?	The structure of the course is built around the lectures and weekly laboratory classes as well as associated readings. The concepts introduced and discussed in the lectures are reinforced through the self-guided and self-paced wet and computer laboratories and the field trip. The field trip is compulsory and will be undertaken during mid-semester break (Thurs-Fri 29-30 Sep). Students will incur costs. Please check details on Moodle.	
Teaching Strategies	**Guidelines on teaching:**	**Application to course:**
	A climate of enquiry should be developed where students feel challenged	Emphasis of the complexity of geochemical systems – what is known and what is not known
	Activities should be interesting and challenging	Field and laboratory work involves students in planning and experiences
	Material must be perceived as relevant to future study or professional practice	Laboratory and field exercises are based on typical projects that young professionals would undertake.
	There must be dialogue/interaction between lecturers and students	Some of the teaching (especially laboratories) will follow a classical Greek dialectic approach
	There should be multiple teaching methods	Lectures, laboratories, fieldwork and readings
	Goals, outcomes and requirements of the course must be clearly articulated	The relevance of each topic and the purpose and outcomes of the laboratory work will be discussed
	Students are to be encouraged to take responsibility for own learning	Field trips require students to undertake largely undirected note taking; students to interpret nature of data collected during laboratory classes and field trip
	Broad graduate attributes must be developed	See above
	Co-operative work with peers assists learning	Much of the work is group-based, though reporting is individual
	There must be informative and timely feedback to students on progress	Weekly quizzes will be used to assess student learning and build learning outcome

3 COURSE SCHEDULE, ASSESSMENT & STAFF

3.1 SCHEDULE

	Lecture 1 (Matthews B)			Lecture 2 (Matthews B)			Labs (G12)	Assessments
	Monday 12-1pm			Friday 2-3pm			Tuesday 9-11 am, 12-2pm or 3-5pm	
Wk 1	25 Jul	Introduction to course	MvdL	29 Jul	The Solar System; Earth and its Place in the Universe	DRC	No lab	
Wk 2	1 Aug	Formation of Earth's Crust & Plate tectonics	DRC	5 Aug	The wonder of minerals	ITG	Plate Tectonics	Plate tectonics exercise - hand in at end of lab
Wk 3	8 Aug	Anatomy of a volcano: Mt Canobolas	JT	12 Aug	Anatomy of a batholith: Icely/Bathurst	MvdL	Sedimentary Rocks and Minerals	
Wk 4	15 Aug	Sedimentary - rocks	ITG	19 Aug	Sedimentary – regolith & soils	JT	Igneous Rocks	Sed. Rocks and minerals quiz runs at the start of the lab
Wk 5	22 Aug	Sedimentary – regolith & soils	JT	26 Aug	Geochemistry - carbon cycle atmosphere	MvdL	Laboratory description of soil monoliths	Igneous quiz - runs at the start of the lab
Wk 6	29 Aug	Palaeontology intro, early life & invertebrate palaeontology	ME	2 Sep	Intro to Human Origins and Archaeology 1	DC	Invertebrate palaeontology	Soil quiz - runs at the start of the lab
Wk 7	5 Sep	Intro to Human Origins and Archaeology 2	DC	9 Sep	Exploring the 6 great extinctions	MA	Human Origins and Archaeology	Palaeoanthropology and archaeology exercise - hand in at end of lab
Wk 8	12 Sep	Fossils of Riversleigh & Cape York	MA	16 Sep	Global water cycle	MvdL	Vertebrate palaeontology	Invertebrate & Vertebrate palaeontology exercise – due Friday
Wk 9	19 Sep	The Sydney Basin	ITG	23 Sep	The Lachlan Fold Belt	ITG	No lab	Review of labs & lecture content – Moodle open book quiz
MID-SEMESTER BREAK ---Bathurst Fieldtrip: Thursday 29 September - Friday 30 September---								
Wk 10	3 Oct	*No lecture (post fieldtrip)*		7 Oct	*No lecture (post fieldtrip)*		No lab	
Wk 11	10 Oct	Biogeography I	ME	14 Oct	Biogeography II	ME	Biogeography	Biogeography exercise - hand in at end of lab
Wk 12	17 Oct	Natural hazards - Volcanoes and tsunamis	MvdL	21 Oct	Coal seam gas	AB	No lab	
Wk 13	24 Oct	Contribution of earth science to society	MvdL	28 Oct	Exam guidance	MvdL	No lab	

3.2 LECTURERS

Role		Name	Contact Details	Consultation Times
GEOS1211 Course Coordinator	MvdL	Ms Mira van der Ley	m.vanderley@unsw.edu.au & 9385 8030	By appointment
Lecturer	JT	Dr John Triantafilis	j.triantafilis@unsw.edu.au	By appointment
Lecturer	DRC	A/Prof David Cohen	d.cohen@unsw.edu.au	By appointment
Lecturer	MVK	Dr Ian Graham	m.vankranendonk@unsw.edu.au	By appointment
Lecturer	ME	Dr Malte Ebach	mcebach@unsw.edu.au	By appointment
Lecturer	MA	Prof Michael Archer	m.archer@unsw.edu.au	By appointment
Lecturer	DC	A/Prof Darren Curnoe	d.curnoe@unsw.edu.au	By appointment
Lecturer	AB	Prof Andy Baker	a.baker@unsw.edu.au	By appointment

*** For lab demonstrators, see Moodle


Ms Mira van der Ley


Dr John Triantafilis


A/Prof David Cohen


Dr Ian Graham


Dr Malte Ebach


Prof Michael Archer


A/Prof Darren Curnoe


Prof Andy Baker

3.3 ASSESSMENT

Tasks	% of total mark	Knowledge and abilities assessed	Assessment criteria	Date of		Feedback		
				Release	Submission BE AWARE: Timing may change!	WHO	WHEN	HOW
Lab Assignment #1	5	Plate Tectonics	Laboratory Report	Wk 2	Wk 2	DRC/MvdL	Wk 3	Moodle
Lab Assignment #2	5	Sedimentary Rocks and Minerals	Quiz	Wk 4	Wk 4	IG/MvdL	Wk 5	Moodle
Lab Assignment #3	5	Igneous Rocks	Quiz	Wk 5	Wk 5	IG/MvdL	Wk 6	Moodle
Lab Assignment #4	5	Laboratory description of soil monoliths	Quiz	Wk 6	Wk 6	JT/MvdL	Wk 7	Moodle
Lab Assignment #5	5	Human Origins and Archaeology	Lab report	Wk 7	Wk 7	DC/MvdL	Wk 8	Moodle
Lab Assignment #6	5	Invertebrate & Vertebrate palaeontology	Lab report	Wk 6	Wk 8	IG/MvdL	Wk 9	Moodle
Mini review quiz	5	Review of labs & lecture content – Moodle open book quiz	Quiz	Wk 9	Wk 9	Automatic feedback	Immediate	Moodle
Lab Assignment #7	5	Biogeography	Lab report	Wk 11	Wk 11 lab	ME	Wk12	Moodle
Field trip	20	Field observations and team work	Group report & presentation	During trip	During trip	MvdL	Wk10	Moodle
Final Exam	40	Please attend the final 'Exam Guidance' Lecture. The final exam runs during the official exam period.						

4 ADDITIONAL RESOURCES AND SUPPORT

4.1 BOOKS

RECOMMENDED EARTH SCIENCE TEXTBOOKS:

Branagan, D.F., Packham, G.H. (2000). Field Geology of New South Wales. New South Wales Department f Mineral Resources, Sydney, Australia.

Chernicoff, S., Fox, H.A. and Tanner, L.H. (2002). Earth: Geologic Principles and History.

Conte, D.J., Thompson, D.J. Moses, L.L. (1997). Earth Science: An Integrated Perspective. Wm. C. Brown Publishers.

Marshak, S. (2005). Earth: Portrait of a Planet. WW Norton and Company.

Marshak, S. (2007). Essentials of Geology. W.W. Norton and Company, NY

Marshak, S. (2009). Essentials of Geology. W.W. Norton and Company, NY

Marshak, S. (2012). Earth Portrait of a Planet.+Geotours Workbook Norton

Lutgens, K. and Tarbuck, E.J. (2003). Essentials of Geology. Prentice Hall.

Skinner, B.J., Porter, S.C. (2000). The Dynamic Earth. John Wiley and Sons.

Stanley, S.M. (1999). Earth Systems and History. W.H. Freeman and Company.

Tarbuck, E.J., Lutgens, K. (2005) Earth: An Introduction to Physical Geology. International Edition. Prentice Hall.

RECOMMENDED GEOPHYSICS TEXTBOOKS:

Reynolds, J.M. (1997). An Introduction to Applied and Environmental Geophysics. John Wiley and Sons.

Mussett, A.E., Aftab Khan, M. (2000). Looking into the Earth. Cambridge University Press.

RECOMMENDED BIOGEOGRAPHY TEXTBOOKS:

Parenti, L.R. & Ebach, M.C. (2009). Comparative Biogeography: Discovering and Classifying Biogeographical Patterns of a Dynamic Earth. University of California Press, Berkeley.

RECOMMENDED SOIL TEXTBOOKS:

Sharman, M.R., Puri, G (2002) Essential Soil Science, Blackwell Publishing, Oxford.

Brady, N.C., Weil R.R. (2002). Elements of the Nature and Properties of Soil. Prentice Hall.

Charman, P.E.V., Murphy, B.M. (eds.) (2000). Soils, Their Properties and Management, 2nd Edition, Sydney University Press, Sydney.

Gerrard, J. (2003). Fundamentals of Soils. Routledge. London, UK.

McKenzie, N.J., Jacquier, D., Isbell, R., Brown, K. (2004). Australian Soils and Landscapes: An Illustrated Compendium. CSIRO, Canberra.

Singer, M.J. and Munns, D.N. (2006). Soils: an Introduction. Prentice Hall.

4.2 Societies

Geological Society of Australia: http://www.gsa.org.au/

Australian Institute of Geoscientists: http://www.aig.asn.au/

Australian Soil Science Society: http://www.asssi.asn.au/

The Linnean Society of NSW: http://linneansocietynsw.org.au/

4.3 Computer Laboratories or Study Spaces

Room G12 is used for all the labs. You may be able to access this room during normal business hours by requesting assistance from the BSB office (G27). Please ensure the doors are properly closed on leaving as thieves have attempted to steal gear from this room.

Students enrolled in any BEES subjects should have swipe card access to the G07 computer lab, which is accessible at any time of the day (unless a class has the room booked).

5 Health & Safety

According to the School of BEES' policy (http://www.bees.unsw.edu.au/hs-accountabilities-and-responsibilities), each student is responsible for:

- Taking reasonable care for his or her own health and safety, and
- Taking reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons, and
- Complying, so far as reasonably able, with any reasonable instruction that is given to ensure UNSW is not in breach of the NSW WHS Act 2011, and
- Complying with UNSW HS policies, procedures and guidelines and BEES HS protocols ,
- Taking action to avoid, eliminate or minimise hazards
- Making proper use of all safety devices and personal protective equipment
- Seeking information or advice regarding hazards and procedures before carrying out new or unfamiliar work
- Being familiar with emergency and evacuation procedures, the location of first aid and emergency personnel and equipment, and if appropriately trained, the use of such equipment.

The School of BEES recognises its obligations to provide a safe working environment for all persons involved in school-related activities. To achieve this goal with regards to teaching and learning, the school adopts the UNSW Health and Safety Policy v4.1 and the H336 HS Responsibility, Authority and Accountability Procedure. These documents stipulate that everyone attending a UNSW workplace must ensure their actions do not adversely affect the health and safety of others. This outcome is achieved through the establishment of a documented chain of responsibility and accountability for all persons in the workplace, extending from the Head of School through to the students undertaking courses offered by the School of BEES.

As part of this chain of responsibility and accountability, the Course Authority is responsible for ensuring all activities associated with this course are safe. The Course Authority has undertaken detailed risk assessments of all course activities and identified all associated potential hazards. These hazards have been minimised and appropriate steps taken to ensure your health and safety. For each activity, clear written instructions are given and appropriate hazard warnings or risk minimisation procedures included for your protection.

6 ACADEMIC INTEGRITY, REFERENCING AND PLAGIARISM

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and plagiarism can be located at:

The Current Students site https://student.unsw.edu.au/plagiarism, and

The ELISE training site http://subjectguides.library.unsw.edu.au/elise/presenting

The Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct.

7 ADMINISTRATIVE MATTERS

<table>
<tr><td>Expectations of Students</td><td colspan="3">Students are expected to attend all lectures and practicals. If you miss more than 20% of your labs you may be excluded from the exam.
The fieldtrip is compulsory.</td></tr>
<tr><td>Tests, fieldtrip assignment submission, final exam</td><td colspan="3">If you are ill or suffer misadventure whilst travelling to university to undertake a test or attend the fieldtrip, you are required to e-mail the course coordinator, Mira van der Ley (m.vanderley@unsw.edu.au) as soon as possible, but at the latest, within three days of any test or assessment, or one week after the final theory exam. Please provide a copy of your medical certificate or other documentation supporting your misadventure as soon as convenient. An alternative test will be arranged at a mutually convenient time.
PENALTY: There will be a penalty of 10% for any missed test (or final exam), unless a medical certificate is provided.

The fieldtrip is compulsory and will require payment from students.</td></tr>
<tr><td>Examination Procedures</td><td colspan="3">See https://student.unsw.edu.au/exam-rules</td></tr>
<tr><td>Equity and Diversity</td><td colspan="3">Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or https://student.unsw.edu.au/disability).
Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made (https://student.unsw.edu.au/disability).</td></tr>
<tr><td rowspan="3">Grievance Policy</td><td colspan="3">See https://student.unsw.edu.au/complaints</td></tr>
<tr><td>School Contact</td><td>Faculty Contact</td><td>University Contact</td></tr>
<tr><td>A/Prof Jess Sammut
School of BEES
j.sammut@unsw.edu.au
Tel: 9385 8281</td><td>Dr Chris Tisdell
Associate Dean (Education)
cct@unsw.edu.au
Tel: 9385 7111</td><td>University Counselling Services
Tel: 9385 5418</td></tr>
</table>

8 ADDITIONAL SUPPORT FOR STUDENTS

The Current Students Gateway: https://student.unsw.edu.au/

Academic Skills and Support: https://student.unsw.edu.au/academic-skills

Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing

Disability Support Services: https://student.unsw.edu.au/disability-services

UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html

Earth and Environmental Sciences. Browse the following groundbreaking articles nominated by our Editors-in-Chief and read why they believe they could help change the world. Enjoy free access until the end of July, 2018. Environmental Earth Sciences is an international multidisciplinary scientific journal published 24 times a year by Springer. Its self-stated focus is on "all aspects of interaction between humans, natural resources, ecosystems, special climates or unique geographic zones, and the earth". Its subject areas include water and soil contamination caused by waste management; environmental problems associated with transportation by land, air, and water; and geological processes that may impact biosystems or