GEOS251

Minerals, Energy and the Environment

S1 Day 2015

Dept of Earth and Planetary Sciences

Contents

General Information

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Credit points
3

Prerequisites
12cp

Corequisites

Co-badged status

Unit description
This is a general education unit that introduces students to the technical, social, economic and environmental aspects that lie behind the production and use of mineral and energy resources in Australia and the rest of the world. The end products of these resources are familiar to us as steel for cars, aluminium for pots and pans, crude oil for petrol and coal for electricity. Nowadays, we have to consider acid rain, the greenhouse effect, heavy metal pollution, radiation, land degradation and land rights. Scarcity and resource exhaustion are also concerns. We demand and accept the goods and services provided by the minerals industries, including the increased wealth resulting from mineral exports, yet increasingly oppose the development of the resources that produce these goods. This does not mean that opposition to development is necessarily bad, or that development is necessarily good. What it does mean is that it is important to look at the broad picture rather than emotions. Learn about questions like: What is the economic importance of Australian mining? What are the environmental problems associated with this mining? Where are Australia's fossil fuels? How long will they last? Debate topics like: Should Australia adopt nuclear power as a 'clean' energy source? Should Australia, like Norway, insist on mining companies contributing to long term community wealth?

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources

Appreciation for the role and necessity for government, community and industry in determining policy

An ability to research and evaluate evidence regarding issues in the minerals, energy and environmental industries

Assess the validity of scientific information

Communicate the findings of individual and group driven research through scientific writing and presentations

Develop informed opinions regarding societal issues, and understand what influences your personal decision making process

Assessment Tasks

Name	Weighting	Due
Assignment 1	5%	13/3/15
Assignment 2	15%	24/4/15
Assignment 3	20%	22/5/15
ReadinGame Quiz	10%	Week 13
Fortnightly quizzes and pracs	10%	Throughout semester
Final exam	40%	TBA

Assignment 1

Due: **13/3/15**
Weighting: **5%**

This assignment will be smaller than the other assignments. Its aim is to a) get you to use the internet

to acquire knowledge and insight, b) summarize this comprehensively and c) present it in a short 3

minute presentation.

Topic: The composition of an everyday article: Origin and Issues

Remember the aim of this unit: "*This is a general education unit that introduces students to the technical, social, economic and environmental aspects that lie behind the production and use of mineral and energy resources in Australia and the rest of the world. The end products of these resources are familiar to us as steel for cars, aluminium for pots and pans, crude oil for petrol and coal for electricity. Nowadays, we have to consider acid rain, the greenhouse effect, heavy metal pollution, oil spills, radiation, land degradation and land rights. Scarcity and resource exhaustion are also concerns.*"

This assignment is designed to lead you into the main themes of the unit by asking you to investigate the significance of metals, energy and minerals in our everyday life. You are asked to look into the make-up of an everyday article e.g car (or specific parts of these), bicycle, refrigerator, airconditioning system, fan, oven, cutlery, pots, washing machine, watches, mobile phones, computers (or parts of those), paint etc. and look into 2 of the main minerals/metals/ resources used for this article, their production, environmental issues with their production etc.

You will need to write a short, 1 page summary of your findings, and produce a short 3 min. presentation. This presentation (audiofile and separate ppt file; or a movie as .mov or .avi if you prefer) will be made available to everybody in the class and form part of the "lectures" i.e. information given in this unit. In addition, normally when you view other presentations you learn a lot of how to do a presentation by seeing yourself what worked and did not work.

There are two parts that need to be submitted for this assignment:

Part 1: Short summary of your findings (1 page maximum), including the following

a) present the everyday article you decided to concentrate on

b) summary of main resources used to manufacture the article including minerals, metals, energy required to produce the article

c) concentrate on **2** of the main minerals/metals/resources used for the article – give the main world suppliers (countries) of this mineral/metal, their history price development, and issues with the environmental and/or societal impact associated with the mining of the resource you have identified

Part 2: Presentation

a) Prepare a powerpoint presentation maximum of 5 slides (to be submitted)

b) record a short 3 minute presentation of your findings (video or audiofile with specific reference to slide no. of your presentation with home video/camera/phone). Be sure to adhere to suggestions (size, clarity etc) in the “How to give a presentation” (Appendix 1). Your presentation will be made available to your fellow students to view and content will be tested in the end of year exam.

Your commodities are:

Surname starting with:

Item:

Choose two of the following commodities

A-B

iPad/Smartphone

Cu, REE, Li, In

C-D

Car

Al, Fe, Cu, plastic, Pt, REE

E-I

Widescreen TV

Plastic, Ag, Cd, REE, In

J-L

Paint

Zr, Pb, Ti, Plastic

M-R

Batteries

Pb, Zn, Cd, Li, Ni

S

Cement

Ca, Fe, Al, coal

T-V

Solar Panels

Si, Cd, Ge, Ga, Ru

W-Z

Lights & smoke detector

Am, W, Ar, N

On successful completion you will be able to:

- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
- An ability to research and evaluate evidence regarding issues in the minerals, energy and environmental industries
- Assess the validity of scientific information
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- Develop informed opinions regarding societal issues, and understand what influences your personal decision making process

Assignment 2

Due: **24/4/15**
Weighting: **15%**

Uranium Mining and Nuclear Waste Disposal

Australia has the largest reserves of uranium of any country in the world. Australia is the second largest exporter of uranium with annual export income of more than 990 million dollars. However, despite the considerable economic benefits of mining and exporting uranium, any new mine proposal is met with fierce public opposition. A permanent repository for nuclear waste has yet to be built on any continent, but the quantity of nuclear waste from power-generating facilities continues to increase.

For example, Europe is intensifying its search for a feasible underground storage sites for nuclear waste. France, along with Britain, Japan and Russia, currently reprocess their nuclear waste and then hold it in an interim storage facility. Germany is also in need of a permanent way of storing nuclear waste (See link below). http://www.spiegel.de/international/germany/0,1518,672147,00.html

In 1971 a salt mine in Morsleben, Germany was chosen as repository for nuclear waste. However, storage of nuclear waste was terminated in 1998 after problems with the geological structure of the salt dome.

The United States is also still struggling to find a suitable place for its accumulating nuclear waste (see link below).

http://www.nytimes.com/2009/03/06/science/earth/06yucca.html

While Australia does not use any uranium for power generation and thus produces no high-level radioactive waste, the possibility of building a repository for global high-level nuclear waste in a remote area of Western Australia, the so-called Pangea Concept, was proposed in 2001. While

its major proponent, Pangea Resources International, a multinational company, ceased operations in 2001 its key players have established ARIUS, an Association for Regional and International Underground Storage". Some people argue that, since Australians are prepared to enjoy the economic benefits of exporting uranium, we should also be prepared to take responsibility for some its wastes. This issuehas recently been in the news again as the discussion on a suitable location in Australia continues (See for example articles in The Sydney Morning Herald). Earth scientists are well placed to inform this debate from a safety pint of view (eg, see Prof Mike Sandifords' (Melbourne University) discussion at http://jaeger.earthsci.unimelb.edu.au/msandifo/Policy/nuclear.html).

Topic: You are asked to consider the advantages and disadvantages of uranium mining and of building a repository for global high level nuclear waste in Australia.

Research Component (65%)

In no more than 1 page per part, you are asked to:

a. Describe and briefly evaluate the benefits and costs to Australia of uranium mining.

b. Explain why Western Australia is considered a prime location for establishing a high-level nuclear waste repository.

c. Outline the potential benefits of building such a repository.

d. Outline the potential problems of building such a repository.

Individual Component (35%)

As an individual, you are asked to respond to the following (max 1 page per part):

a. In your opinion, should Australia allow mining of its uranium deposits? If so, under what conditions? Justify your answer.

b. Discuss whether you would support building of a high-level waste repository facility in Australia, giving reasons for, and reservations in, your answer.

c. If you are in favour of building such a repository, explain how you would go about selling the idea to the Australian public and government; if not, offer your preferred solution to the issue of global nuclear waste

A brief introduction to the assignment and summary are also expected. Accurate referencing of all sources of information is essential.

Due Date: Friday 24/4/15

Some starting Material

Texts from Resources (iLearn))

- *Outlook for the uranium industry*

- *Pangea Technical report*

Useful webpages

- World Nuclear Association: http://world-nuclear.org/info/inf48.html

- Australian Government (2010) "Radioactive Waste Management"

http://www.arpansa.gov.au/radiationprotection/factsheets/is

- US Environmental protection Agency: http://www.epa.gov/rpdweb00/docs/radwaste/

- Leslie Lai and Kristen Morrison(2008) "Nuclear Age Peace Foundation", "Nuclear Energy Fact Sheet".

http://www.wagingpeace.org/menu/issues/nuclear-energy-&-waste/nuclear-energy-factsheet.Htm

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- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
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Assignment 3

Due: **22/5/15**
Weighting: **20%**

Carbon Capture and Storage – Australia's role in combating Global Warming

Many people consider that global warming, caused primarily by increased atmospheric carbon dioxide

(CO_2) concentrations from burning fossil fuels, could have catastrophic effects. Possible outcomes are:

- increased global temperatures, resulting in destruction of ecosystems and spread of tropical diseases

- higher incidence of droughts, floods and severe storms, and associated crop failures, starvation and deaths

- melting of polar ice caps, resulting in rising sea level, and inundation and displacement of low lying communities; e.g., Sydney!

- possible changes in oceanic circulation patterns, which could potentially cause sudden drastic changes in climate.

Australia is one of the highest per-capita energy consuming countries in the world. Australia is also almost unique in deriving a large majority of its electrical energy from burning coal, the most CO2- intensive fuel that exists. Energy and Industrial Processes contributed to almost three-quarters of Australia's total net greenhouse gas (GHG) emissions in 2006 and 2007. Coal contributed to about 37% of these.

One technically possible way of substantially reducing GHG emissions from coal-fired power stations would be to capture the CO2, compress it and transport it by pipeline and/or ship to a secure storage location. Capture of the CO2 can in principle be done in two different ways:

- after the gas turbine ‘cycle’ in a power station; or

- after fuel combustion in a conventional (pulverised coal or natural gas) power station, by extraction of CO_2 from flue (exhaust) gas as it passes up the chimneys.

The main option for storage of CO2 from a large point source such as a power station is deep underground, either in depleted oil and gas fields, or in un-minable coal mines or in saline aquifers located in sedimentary rocks.

The International Energy Agency (IEA) GHG 2008 report estimates that global Carbon Capture andStorage (CCS) in electricity generation and industrial processes could be responsible for 15-20% of emissions reductions (5-10 Gt CO2 per year) in a range of scenarios. One of the advantages of CCS is that it’s relatively compatible with the current energy supply infrastructure and has well defined health, safety and environmental practices. As such, it is seen by many as one of few technologies available to mitigate CO2 emissions at a large scale (IEA). A serious disadvantage of carbon capture is that retrofitting existing plants with capture technology appears too costly. Therefore, it is proposed that only newly built power plants are subjected to mandatory immediate carbon capture retrofits.

The Australian Government decided to provide AU$2.4 billion support investment in large-scale integrated Carbon Capture and Storage pilot projects in Australia. Currently, there are four of these projects underway in Australia: The Otway Basin Pilot Project and Monash Energy Project in Victoria, the Gorgon Project in Western Australia, and the CS Energy Project in Queensland. This would imply that CCS is a viable and sustainable way of reducing CO2 levels in the atmosphere.

However, carbon capture and storage is a very complex issue and it has many aspects which need to be considered when deciding on its feasibility such as for example the available technology, cost and safety perception among the public of long term carbon storage.

A problem which is only relevant to Australia has been pointed out by a preliminary study by the GEODISC group of the Australian Cooperative Research Centre for Greenhouse Gas Technologies. They found that the largest storage potential is in Western Australia but almost all of the biggest point sources emitters are in eastern Australia. As a result, Australia only has the

potential to store 100-115 Mt per year of CO2, corresponding to 27%-31% of total annual CO2 emissions (Bradshaw et al., 2002). Therefore, according to the GEODISC group, carbon storage is at best a partial solution and Australia would do well to continue with and expand the development of efficient energy use and renewable sources of energy.

World wide, around 20 carbon capture and storage pilot projects have been proposed (Gibbins and Chalmers 2008) but large-scale feasibility has yet to be demonstrated. In 2008, G8 countries agreed to commit to large scale projects with deployment projected to be in 2015. With capture technologies well understood but remaining to be demonstrated at a large commercial scale, CCS is not expected before 2020.

Research Component (65%)

In no more than 1 page per part, you are asked to:

1. Describe what the reasons could be for Australia wanting to contribute to the development of CCS while developing countries such as India and China continue to build power stations but are not at the forefront of CCS.

2. Describe and evaluate what the main concerns are of Carbon Capture and Storage.

3. Describe how CCS will affect the cost of electricity for an average Australian house hold and what the main contributions to this change in cost are.

4. Tabulate the current contribution of each of the main renewable energy sources (e.g., wind, solar) to Australia's electricity supply. Briefly evaluate the importance of each energy source to Australia's overall electricity supply.

Individual Component (35%)

As an individual, you are asked to respond to the following (max 1 page per part):

1. Explain if you think CCS is a feasible option for Australia in reducing its carbon emissions and also explain why.

2. Compare the time that is needed for CCS to become large scale to

- firstly, the timing of the global CO2 reduction targets which the G8 has set themselves

- and secondly, the time it takes to plan and build a new power station

Give your view on how this could affect the development of CCS

3. What alternatives would you present if CCS would turn out not to be viable? Name at least three and explain why you think these options are most likely to tackle the problem of reducing CO2 emissions.

Material (to start with)

Texts from Resources (iLearn)

- *NSW first carbon storage*

- *World energy and climate change*

- *Coal and GHG (Greenhouse Gas Storage) Emissions Australia*

- *Clean energy for Australia*

- *Clean energy for Australia summary*

- *Sorting out the facts from fiction*

- *ACA Garnaut*

- *ACA Garnaut extra*

- *Development of Electricity Generation and Technologies*

Useful webpages

- http://iea.org/ccs/

- http://www.ga.gov.au/ghg/index.jsp

- http://www.worldcoal.org/carbon-capture-storage/

- http://www.co2crc.com.au/

Due Date: Friday 22/5/15

On successful completion you will be able to:

- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
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ReadinGame Quiz

Due: **Week 13**
Weighting: **10%**

We will be using a custom designed and built, online learning tool; “The ReadinGAME”. This game is designed to operate on a calender week cycle (from Sunday to Sunday), and involves you being able to ask a question related on the weeks material from the readings and lectures. You will then be able to answer questions posed by other students, and most importantly, you

will not only be able to score points for correctly answering the questions, but you will also be able to comment and discuss the questions, and rate whether they are good/not so good questions etc.

Importantly, in the process you will be learning and reinforcing the weeks material as well as having a lot of fun- it can be quite addictive.

To play, follow the link in iLearn, and simply ask a question relevant to the weeks material. You will then be able to play, by answering other questions and watching how your score accumulates. You will also be able to give feedback on other peoples questions and monitor your performance. There are multiple scoring paths, and different types of scores to achieve, depending on you interests.

At the end of the semester there will be a quiz worth 10% of question derived from the ReadinGAME.

On successful completion you will be able to:

- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
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- Assess the validity of scientific information

Fortnightly quizzes and pracs

Due: **Throughout semester**
Weighting: **10%**

Quizzes and practical assignments ate roughly fortnightly intervals

On successful completion you will be able to:

- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
- Appreciation for the role and necessity for government, community and industry in determining policy
- An ability to research and evaluate evidence regarding issues in the minerals, energy and environmental industries
- Assess the validity of scientific information

Final exam

Due: **TBA**

Weighting: **40%**

Final exam on material from lectures, assignments and pracs.

On successful completion you will be able to:

- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
- Appreciation for the role and necessity for government, community and industry in determining policy
- Assess the validity of scientific information

Delivery and Resources

Delivery is via lectures, which are recorded. Quizzes and assignments can be done online through iLearn, and all assignments are submitted through iLearn. Attendance at tutorials/ practicals is compulsory for internal students.

Unit Schedule

Week	**Lecture A**	**Lecture B**	**Tutorial session**
Week 1 27/2	Lect 1: Introduction BFS	Lect 2: Global Mining Industry I ES	
Week 2 6/3	Lect 3: Global Mining Industry II ES	Lect 4: The Exploration Process ES	*Mineral exploration: Identifying a target (or, where is it?)*
Week 3 13/3	Lect 5: Mining and Processing technology ES	Lect 6: Metals and industrial minerals ES	
Assignment 1 Due 5pm Fri 13/3			
Week 4 20/3	Lect 7: Supply and demand in the minerals industry ES	Lect 8: Financing the Minerals Industry ES	Mineral exploration: Evaluating a resource (or, how much is it worth!)

Week 5 27/3	Lect 9: Mining and Environment BFS	Lect 10: Land Use, Native Title BFS	*Watch Presentations of Fellow students*
Mid semester Break (3/4-20/4 2015)			
Week 6 24/4	Lect: 11: Strategic commodities: REE BFS	Lect 12: Mining and Society BFS	*Strategic Commodities: REE*
Assignment 2 Due 5pm Fri 24/4			
Week 7 1/5	No Lectures- Allocated time for assignment 3		
Week 8 8/5	Lect 13: Supply, Demand, Energy BFS	Lect 14: Uranium BFS	
Week 9 15/5	Lect 15: Oil and Gas SG	Lect 16: Coal SG	*Peak Oil*
Week 10 22/5	Lect 17: Diamonds BFS	Lect 18: Climate BFS	
Assignment 3 Due 5pm Fri 22/5			
Week 11 29/5	Lect 19: Alternative Energy I BFS	Lect 20: Alternative Energy II BFS	*Human Induced Climate Change and mass extinctions: fact or fiction?*
Week 12 5/6	Lect 21: Sustainable Development I BFS	Lect 22: Sustainable Development II BFS	*Revision Q&A*
Week 13 12/6	Review Lecture, Results of polling!		

BFS = Dr Bruce Schaefer; ES = Dr Ed Saunders; SG = Prof Simon George

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students

should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- An ability to research and evaluate evidence regarding issues in the minerals, energy and environmental industries
- Communicate the findings of individual and group driven research through scientific writing and presentations
- Develop informed opinions regarding societal issues, and understand what influences your personal decision making process

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- ReadinGame Quiz
- Fortnightly quizzes and pracs

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- An ability to research and evaluate evidence regarding issues in the minerals, energy

and environmental industries
- Assess the validity of scientific information
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- Develop informed opinions regarding societal issues, and understand what influences your personal decision making process

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- Final exam

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Appreciation for the role and necessity for government, community and industry in determining policy
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- Communicate the findings of individual and group driven research through scientific writing and presentations
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- Assignment 3

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- Final exam

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

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Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- An understanding of which are the major resources necessary for our modern society to function and insights into the economic drivers for the optimization of these resources
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- An ability to research and evaluate evidence regarding issues in the minerals, energy and environmental industries
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- Final exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Appreciation for the role and necessity for government, community and industry in determining policy
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- Communicate the findings of individual and group driven research through scientific

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Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Assess the validity of scientific information
- Communicate the findings of individual and group driven research through scientific writing and presentations
- Develop informed opinions regarding societal issues, and understand what influences your personal decision making process

Assessment tasks

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- Assignment 2
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- Final exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded,

sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

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Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

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- An ability to research and evaluate evidence regarding issues in the minerals, energy and environmental industries
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