GEOS306

Exploration and Environmental Geophysics II

S2 Day 2015

Dept of Earth and Planetary Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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AHH Level 2 Room 2.636 (181)

Lecturer
Craig O'Neill
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Credit points
3

Prerequisites
GEOS305

Corequisites

Co-badged status

Unit description
This unit further explores the application of geophysical techniques from exploration for minerals to environmental, engineering and ground water problems. This unit builds on the foundation work covered in GEOS305, incorporating case history studies to further illustrate the application of geophysical methods. Practical work includes laboratory exercises in the reduction, plotting and interpretation of geophysical data. The field excursion gives students an appreciation of the practical application of geophysics, highlighting the advantages and limitations of the techniques studied during the unit.

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:

understanding of the basic concepts of exploration and environmental geophysics

gaining experience in operating geophysical equipment

understanding scientific methodology

competence in accessing, using and synthesising appropriate information

application of knowledge to solving problems and evaluating ideas and information

capacity to present ideas clearly with supporting evidence

Assessment Tasks

Name	Weighting	Due
Oral Presentation	10%	see schedule
Assignment I	10%	Week 7
Assignment II	10%	Week 9
Field Report	30%	Week 13
Exam	40%	exam period

Oral Presentation

Due: **see schedule**
Weighting: **10%**

Each student has to select a topic relevant to the unit on which a 10-15 minute long **oral presentation** must be given during the class hours. A selection of topics is given at the beginning of the unit

On successful completion you will be able to:

- competence in accessing, using and synthesising appropriate information
- capacity to present ideas clearly with supporting evidence

Assignment I

Due: **Week 7**
Weighting: **10%**

Learn about and build geophysical loggers.

On successful completion you will be able to:

- understanding of the basic concepts of exploration and environmental geophysics
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information

- capacity to present ideas clearly with supporting evidence

Assignment II

Due: **Week 9**
Weighting: **10%**

It will consist of questions relating to the topics covered in the first part of the semester and will include questions on both the theoretical and practical aspects of the unit material.

On successful completion you will be able to:

- gaining experience in operating geophysical equipment
- understanding scientific methodology
- application of knowledge to solving problems and evaluating ideas and information

Field Report

Due: **Week 13**
Weighting: **30%**

An individual comprehensive field report is to be presented by each student, and submitted for assessment.

On successful completion you will be able to:

- understanding of the basic concepts of exploration and environmental geophysics
- gaining experience in operating geophysical equipment
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Exam

Due: **exam period**
Weighting: **40%**

There will be a **final two-hour examination** held during the examination period in November/ December. It will consist of a choice of questions to be answered in essay style.

On successful completion you will be able to:

- understanding of the basic concepts of exploration and environmental geophysics

- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Delivery and Resources

Textbook

There is no compulsory textbook for this unit, but I recommend that you get a copy of "*An Introduction to Applied and Environmental Geophysics*" by *Reynolds* or *"An Introduction to Geophysical Exploration" by Kearey et al* as they look at the material at an appropriate level. As well, "*Geophysics for the Mineral Exploration Geoscientist*" by *Dentith and Mudge* is also worthwhile. If you already have of one of the following books then that should be sufficient. All the books listed below give a good grounding in geophysics, just with a different focus

Burger, H.R*., Exploration Geophysics of the Shallow Subsurface,* Prentice-Hall, 1992. [TN269.B86]

Dentith M. and Mudge S.T., Geophysics for the Mineral Exploration Geoscientist, Cambridge University Press, 2014.

Gunn, P*., AGSO Journal of Australian Geology and Geophysics 17, 1997*. [QE340.A7]

Isles D.J. and Rankin L.R., *Geological Interpretation of Aeromagnetic Data*, ASEG, 2013 **e-book**

Kearey, P., Brooks, M. and Hill, I., *An Introduction to Geophysical Exploration, 3rd Edition,* Blackwell Scientific Publications, 2002. [TN269.K36/2002]

Lowrie, W., Fundamentals of Geophysics, Cambridge University Press, 1997. [QC806.L67/1997]

Mussett A.E. and Khan M.A., *Looking into the Earth*, Cambridge, 2000. [QE501.M87/2000]

Parasnis, D.S., *Principles of Applied Geophysics*, 5th Edition, Chapman and Hall, 1997. [TN269.P32]

Reynolds, J.M., *An Introduction to Applied and Environmental Geophysics*, John Wiley & Sons, 1997. [QC808.5.R49]

Reynolds, J.M., *An Introduction to Applied and Environmental Geophysics*, 2nd *Edition*, Wiley-Blackwell, 2011. [QC808.5.R49 2011]

Sharma, P.V., *Environmental and Engineering Geophysics*, Cambridge University Press, 1997. [TA705.S515]

Telford, W.N., Geldart, L.P., and Sheriff, R.E., *Applied Geophysics*, 2nd Edition, Cambridge University Press, 1990. [TN269.T44]

Ward, S.H. (editor), *Geotechnical and Environmental Geophysics*, Vol. I-III, Society of Exploration Geophysicists, Tulsa, 1990. [TA705.G426]

The unit also has a WEB site which can be found through the iLearn WEBSITE at https://ilearn.mq.edu.au/login/MQ/ .

Information for students about access to online units is available at

https://ilearn.mq.edu.au/login/MQ/

Referencing

It is important that you understand how to correctly reference the information you do use, as often you will want to legitimately quote material or ideas from other sources. Information obtained from any source, including the Internet, is covered by copyright law. You must acknowledge any source that you refer to in your assignment, both within the text of your assignment, and at the end of it (by including a list of references). Referencing your sources also enables the reader to view your sources and follow your essay. Academic conventions and copyright law require that you acknowledge when you use the ideas of others. In most cases, this means stating which book or journal article is the source of an idea or quotation.

There are two aspects to learn: in-text references and a list of references cited. Please note that for the assignments, we insist that you reference using in-text references, with a reference list at the end (ie, not with footnotes). This is a common way to do it in many areas of science (but not all!), and it reminds you and indicates to the reader what the source is and how old it is. Please use the Harvard Style of referencing.

There is much information on in-text references and referencing of print and non-print sources

available at:

http://libguides.mq.edu.au/content.php?pid=459099&sid=3778407

http://libguides.mq.edu.au/content.php?pid=459099&sid=3759396

How to cite references within the text of an assignment:

These are also called in-text references. When you use another's ideas you should immediately acknowledge your sources, including in figure or table captions. Always give the surname of the author and the date of publication. Use the author-date method of citation for quotations and paraphrasing. Note spelling of et al. (used when 3 or more authors; please remember the fullstop). Note that the in text refs don't have author initials.

Direct quote: Brown et al. (1990, p. 12) conclude that 'the depth to the Moho under the oceans is less than under the continents'. Note that for a direct quote the page must be cited.

General acknowledgement of the source of information: "As explained by Schmidt and Lackie (2014), the Q-Meter is….."

More specific reference but not a direct quote: "The distribution of Martian volcanism in the highlands (Johnson, 2011) can be used to infer… etc."

More general reference to sources: "Most older textbooks in geology (e.g. Peters et al., 1941;

Stamp 1938) either ignored the deep ocean basin deposition or……"

Website in text: "Details about PhD scholarships are available from the Macquarie University web site <http://www.hdr.mq.edu.au/>."

How to create a list of references:

At the end of your assignment, create a list of the references you have cited in the text. Arrange this in alphabetical order of author's surnames. The author's surname is placed first, followed by initials or first name, then other authors the same way, and then the year of publication is given. Where an item doesn't have an author, arrange it by its title.

Then the reference needs the paper or book title, journal (if it's a journal article), publisher (if it's a book) or url and date accessed (if it's a web page). The format should follow the Harvard style as described in these links: it is a good guide, and your references should contain the same information.

Please be very careful (a) to put in the reference list every citation from the text (including web sites) and any figure/table captions, and (b) to not put in the list references that you have not cited in the text or figure/table captions.

Reference examples: journal

Cameron, R.L., Goldich, S.S & Hottman, J.H. 1960. Radioactive age of rocks from the Windmill Islands. Budd Coast, Antarctica. *Stockholm Contributions to Geology* **6**, 1-6.

Goodwin, I.D. 1993. Holocene deglaciation, sea level change and the emergence of the Windmill Islands, Budd Coast, Antarctica. *Quaternary Research* **40,** 70-80.

Sandwell, D.T. & Smith, W.H.F. 1997. Marine gravity anomaly from Geosat and ERS 1 satellite altimetry. *Journal of Geophysical Research,* **102,** No B5. 10,039-10,054.

Reference example: book

Peters, K. E., Walters, C. C. and Moldowan, J. M. (2005) The Biomarker Guide, 2nd Edition. Cambridge University Press, Cambridge, 1155 pp.

Reference example: chapters in edited books

Einstein, A.C., Voldemort, T. M., Vader, D., 2012. How to apply evil. In: Devil, M.A. (Ed.), Handbook of Evil, Wiley, pp. 47-73.

George, S. C., Volk, H., Ahmed, M., Middleton, H., Allan, T. and Holland, D. (2004) Novel petroleum systems in Papua New Guinea indicated by terpane and methylhopane distributions. In: Boult, P. J., Johns, D. R. and Lang, S. C. (Eds), Eastern Australasian Basins Symposium II, Adelaide, 19–22 September, Petroleum Exploration Society of Australia, Special Publication, pp.

575-588.

Reference example (web site, author and date known):

Wright, S. 2004, Open area test site (OATS) development, undergraduate project, University of Southern Queensland, Toowoomba, viewed 27 March 2011, <http://eprints.usq.edu.au/archive/00000047>.

Reference example (web site, author and date not known):

Macquarie University, NSW, viewed 12 January 2012, <http://www.hdr.mq.edu.au/>

Unit Schedule

DATE	LECTURER	TOPIC	PRACTICAL
Week 1	Craig O'Neill	Introduction to the unit	Assignment I
Week 2	Mark Lackie	Dimensional Analysis	Assignment I
Week 3	Simon Williams	Engineering Geophysics	Evil
Week 4	James Austin	Geophysical Response of Ore bodies	More Evil
Week 5	Tim Pippett	Environmental Geophysics	Even more evil
Week 6	Dave Pratt	Potential Field Presentation and Interpretation	Way past evil

Week 7			It will hurt
		Mid Semester Recess **Field Excursion (19 Sept – 23 Sept)**	
Week 8	Barry Smith	Oil and Gas Exploration	Doomed doomed
Week 9		**Public Holiday**	Field data Compilation
Week 10			Field data Compilation
Week 11	Steve Webster	Groundwater Geophysics	Field data Compilation
Week 12	Brad Bailey	Oil and Gas Exploration	Field data Compilation
Week 13	Phil McClelland	Case Histories: Magnetics	Field data Compilation

Learning and Teaching Activities

Assignments

Interpretation and Practical Assignments

Oral Presentation

Oral Presentation

Field Report

Field Report on data acquired on the fieldtrip

Final Examination

Exam

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

- understanding of the basic concepts of exploration and environmental geophysics
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Assessment tasks

- Assignment I
- Assignment II
- Field Report

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

- gaining experience in operating geophysical equipment
- understanding scientific methodology
- application of knowledge to solving problems and evaluating ideas and information

Assessment task

- Field Report

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

- understanding of the basic concepts of exploration and environmental geophysics
- gaining experience in operating geophysical equipment
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Assessment tasks

- Assignment I
- Assignment II
- Field Report

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

- understanding of the basic concepts of exploration and environmental geophysics
- gaining experience in operating geophysical equipment
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Assessment tasks

- Assignment I
- Assignment II
- Exam

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

- understanding of the basic concepts of exploration and environmental geophysics
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Assessment tasks

- Oral Presentation
- Assignment I
- Assignment II
- Field Report
- 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

- understanding of the basic concepts of exploration and environmental geophysics
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Assessment tasks

- Assignment I
- Assignment II
- Field Report
- Exam

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

- understanding of the basic concepts of exploration and environmental geophysics
- understanding scientific methodology
- competence in accessing, using and synthesising appropriate information
- application of knowledge to solving problems and evaluating ideas and information
- capacity to present ideas clearly with supporting evidence

Assessment tasks

- Oral Presentation
- Field Report
- Exam

Changes from Previous Offering

Please note that in 2012, this unit ran as Exploration Geophysics. Updated in 2014 Learning Outcomes Assessment Delivery and Resources Unit Schedule.

2015, changed order of Assignments 1 and 2 from 2014 to better suit what is done during the practical exercises. Delivery and resources have been updated with referencing information. Unit Schedule has been updated.