GEOS306

Exploration and Environmental Geophysics II

S2 Day 2014

Earth and Planetary Sciences

Contents

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General Information

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Lecturer
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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 13
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%**

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:

- 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 13**
Weighting: **10%**

Learn about and build geophysical loggers.

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

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/

Unit Schedule

DATE	LECTURER	TOPIC	PRACTICAL
Week 1	Mark Lackie	Introduction to the unit	Evil
Week 2	Phil McClelland	Case Histories: Magnetics	More Evil
Week 3	Simon Williams	Engineering Geophysics	Even more evil
Week 4	James Austin	Geophysical Response of Ore bodies	Way past evil
Week 5	Tim Pippett	Environmental Geophysics	Assignment II
Week 6	Dave Pratt	Potential Field Presentation and Interpretation	Assignment II
Week 7			It will hurt

		Mid Semester Recess **Field Excursion (27 Sept – 1 Oct)**	
Week 8		**Public Holiday**	Doomed doomed
Week 9	Brad Bailey	Oil and Gas Exploration	Field data Compilation
Week 10	Steve Webster	Groundwater Geophysics	Field data Compilation
Week 11			Field data Compilation
Week 12	TBA	Seismic Case Histories	Field data Compilation
Week 13			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/

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

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

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

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