GEOS305

Exploration and Environmental Geophysics I

S1 Day 2016

Dept of Earth and Planetary Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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Lecturer
Craig O'Neill
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Credit points
3

Prerequisites
6cp from GEOS or MATH or PHYS units at 200 level including GEOS205

Corequisites

Co-badged status

Unit description
This unit explores the application of geophysical techniques from the exploration for minerals to help solve environmental, engineering and ground water problems. Topics include: potential field techniques, induced polarisation, electromagnetic, electrical, seismic and radiometric methods. Generally, emphasis is placed on the applications and relative merits of the various methods for particular aspects of exploration and environmental problems, rather than on rigorous theoretical treatment. Practical work includes: laboratory exercises in the reduction, plotting and interpretation of geophysical data.

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:

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

Assessment Tasks

Name	Weighting	Due
Oral presentation	10%	see schedule
Quiz	15%	see schedule
Assignments	25%	see schedule
Exam	50%	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:

- 3. understanding scientific methodology
- 4. competence in accessing, using and synthesising appropriate information
- 6. capacity to present ideas clearly with supporting evidence

Quiz

Due: **see schedule**
Weighting: **15%**

(1) There will be **three quizzes** during the semester. They will consist of short answer or multiple choice questions relating to the practical work and lecture material.

On successful completion you will be able to:

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

Assignments

Due: **see schedule**
Weighting: **25%**

(1) **Two assignments** will be given to you during the semester. They will consist of questions relating to the topics covered during 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:

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

Exam

Due: **exam period**
Weighting: **50%**

(1) 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:

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

Delivery and Resources

TEXTBOOK AND TECHNOLOGY USED

There is no compulsory textbook for this unit, but I recommend that you get a copy of "*Geophysics for the Mineral Exploration Geoscientist*" by ***Dentith and Mudge*** or "*An Introduction to Applied and Environmental Geophysics*" by ***Reynolds*** or "*An Introduction to Geophysical Exploration*" by ***Kearey et al*** or "*Environmental and Engineering Geophysics*" by ***Sharma*** as they look at the material at an appropriate level.

The unit also has a WEB site which can be found through the iLearn WEBSITE at https://ilearn.mq.edu.au/login/MQ/ . This site contains information such as copies of colour images, copies of PowerPoint's shown in class, and copies of the practicals that we do in class. The WEB site will also allow access to the digital version of the lectures recorded through the iLecture system. It is recommended that you acquire a geophysical text to supplement what is up on the iLearn site. At the start of the year you should be issued with a username and password (Macquarie oneID) to access all the WEB sites available for the units you have taken. This will get you into the front page of the GEOS305 WEB site.

Information for students about access to online units is available at

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

I recommend that you use Mozilla Firefox as your browser, as it seems to have far less problems than Internet Explorer with iLearn.

Unit Schedule

DATE	LECTURER	TOPIC	PRACTICAL
Week 1	Mark Lackie Mark Lackie	Introduction to the unit Physical Properties	Physical Properties
Week 2	Craig O'Neill Craig O'Neill	Data Sampling and Spectral Analysis Filtering and Fourier Analysis	Filtering
Week 3	Craig O'Neill Mark Lackiel	GPR Radiometrics: Acquisition	GPR Acquisition GPR Processing

Week 4	Mark Lackie Mark Lackie	Refraction: GRM, Ray Tracing, VIRT, etc MASW	Refraction Interpretation
Week 5	Bruce Dickson	Radiometrics: Processing and Interpretation	Radiometrics ***Quiz 1***
Week 6	Yingjie Yang	Seismic reflection method	Exploration Seismics
		Mid Semester Recess	
Week 7	Yingjie Yang	Seismic reflection data processing	Exploration Seismics
Week 8	Mark Lackie	Magnetics: Acquisition and Processing Gravity and Magnetics	Potential Field Interpretation
Week 9	Mark Lackie	EM Theory EM Acquisition	EM Stuff ***Quiz 2***
Week 10	Mark Lackie	IP Acquisition and Interpretation EM Interpretation	EM Interpretation
Week 11	Andy Green	Geophysics at 10^{11} kHz – Reflectance of Minerals Geophysics at 10^{11} kHz – Models for Reflectance of Rocks	Remote Sensing Prac
Week 12	Andy Green	Geophysics at 10^{11} kHz – Inverting the Models to Mineralogy Geophysics at 10^{11} kHz – HyLogging Australia	Remote Sensing Prac
Week 13	Mark Lackie Craig O'Neill	Minerals Exploration Geothermal Exploration	Revision ***Quiz 3***

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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources 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

- 2. gaining experience in operating geophysical equipment
- 3. understanding scientific methodology
- 4. competence in accessing, using and synthesising appropriate information
- 5. application of knowledge to solving problems and evaluating ideas and information

Assessment tasks

- Quiz
- Assignments

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

- 2. gaining experience in operating geophysical equipment
- 3. understanding scientific methodology
- 4. competence in accessing, using and synthesising appropriate information
- 5. application of knowledge to solving problems and evaluating ideas and information

Assessment task

- Assignments

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

- 2. gaining experience in operating geophysical equipment
- 3. understanding scientific methodology
- 4. competence in accessing, using and synthesising appropriate information
- 5. application of knowledge to solving problems and evaluating ideas and information
- 6. capacity to present ideas clearly with supporting evidence

Assessment tasks

- Oral presentation
- Quiz
- Assignments

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

- 1. understanding of the basic concepts of exploration and environmental geophysics
- 3. understanding scientific methodology
- 4. competence in accessing, using and synthesising appropriate information
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- 6. capacity to present ideas clearly with supporting evidence

Assessment tasks

- Oral presentation
- Quiz
- Assignments
- 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

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

Assessment tasks

- Quiz
- Assignments
- 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

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

Assessment tasks

- Oral presentation
- Quiz
- Assignments
- 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

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

Assessment tasks

- Oral presentation
- Assignments
- Exam

Changes from Previous Offering

2016: Updated Delivery and Resources and updated schedule