



# GEOS205

## Introduction to Geophysics

S1 External 2016

*Dept of Earth and Planetary Sciences*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Unit Convenor

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Credit points

3

Prerequisites

3cp from GEOS units at 100 level

Corequisites

Co-badged status

Unit description

Lectures in this unit cover, at an introductory level, some of the important geophysical approaches which are used by Earth scientists to explore and understand the Earth's interior. Included are the methods of collecting and interpreting gravity, magnetic, seismic and electrical data and their use in assembling the presently held picture of the crust, mantle and core. Practical classes involve reducing and interpreting geophysical data from both exploration and global problems. An excursion provides an opportunity to carry out a field survey and interpret the results in terms of geological structure and environmental aspects.

## 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 geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;
- gaining experience in modelling geophysical data;
- understanding scientific methodology;
- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and

capacity to present ideas clearly with supporting evidence

## Assessment Tasks

Name	Weighting	Due
Assignments	10%	TBA
Quizzes	14%	TBA
Field Report	26%	Week 13
Examination	50%	University Examination Period

### Assignments

Due: **TBA**

Weighting: **10%**

Assignments based on the practical work

On successful completion you will be able to:

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

### Quizzes

Due: **TBA**

Weighting: **14%**

There will be three (3) Quizzes, each worth about 5% of the assessment. These will be held during the session, during week 4, week 8 and week 13. They will consist of short answer or multiple choice questions relating to the lecture material from the period preceding the quiz. Dates will be confirmed in class.

On successful completion you will be able to:

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

## Field Report

Due: **Week 13**

Weighting: **26%**

Performance at, and the report on the field excursion will be assessed, and make up 26% of the final mark. The due dates for external and internal students will be determined in consultation with students at the excursions.

On successful completion you will be able to:

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

## Examination

Due: **University Examination Period**

Weighting: **50%**

There will be a two-hour final examination covering the material presented during the unit, and counting for 50% of the final mark. The examination will consist of a number of short answer questions on definitions and concepts, followed by an essay section requiring further description of concepts and theory.

On successful completion you will be able to:

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

## Delivery and Resources

### Required and Recommended Texts and/or Materials

The textbook for the unit is MUSSETT and KHAN (Looking into the Earth, 2000). The textbook will be available from the COOP Bookshop. Copies of the PowerPoint's shown in the lectures will be available on the unit's WEB page. The recommended textbook is an excellent

text for second year, but you can also consider some of the third year textbooks as well.

The texts you should first consider are DENTITH AND MUDGE (Geophysics for the Mineral Exploration Geoscientist, 2014); SHARMA (Environmental and Engineering Geophysics, 1997) and REYNOLDS (An Introduction to Applied and Environmental Geophysics, 1997), because they cover all the major geophysical topics, and are the recommended texts for the Exploration and Environmental Geophysics I (GEOS305) unit. They have the further advantage of consistently using the SI system of units.

In previous years we used a text by SHARMA (Geophysical Methods in Geology, 2nd Ed, 1986), but this is now out of print. SHARMA covers the global aspect of geophysics in more detail and is a useful reference to have if you can find a 2nd hand copy. In 1998, we used PARASNIS (Principles of Applied Geophysics, 5th Ed) but a change in publisher meant a massive increase in its cost.

However, it is a useful text to refer to if you can find a 2nd hand copy. Other useful texts to consider are; TELFORD ET AL (Exploration, fairly mathematical); KEAREY & BROOKS (Exploration, current 3rd year exploration text); FOWLER (Good solid-earth coverage, used in GEOS386); SLEEP & FUJITA (Solid-earth, more mathematical). The solid earth aspect of this unit is best covered in FOWLER. It is strongly recommended that you have access to a geophysical textbook, particularly if you are studying externally.

## Technology Used and Required

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. As well, this site will access the on-line quizzes that will need to be completed during the Session. 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 GEOS205 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
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Week 1	Mark Lackie	L1	Introduction	Seismic waves
		L2	Wave motion and seismic waves	
Week 2	Mark Lackie	L3	Seismographs and Travel time curves	Earthquake Interpretation
		L4	Earthquakes	
Week 3	Mark Lackie	L5	Seismic exploration	GPR & Refraction Interpretation
	Craig O'Neill	L6	GPR	
Week 4	Mark Lackie	L7	Gravity: Fundamental principles	<i>External Quiz 1</i> Reduction of Gravity Data
		L8	Reduction of gravity data	
Week 5	Mark Lackie	L9	Modelling and Interpretation of gravity data	Gridding & Isostasy
	Craig O'Neill	L10	Isostasy	
Week 6	Mark Lackie	L11	Physics of magnetism	*Gravity Modelling
		L12	The earth's magnetic field	
			<b>Residential Class (9-10 April) Mid Semester Recess</b>	
Week 7	Mark Lackie	L13	Magnetic Surveying Techniques	*Magnetic Modelling
		L14	Interpretation of magnetic data	
			<b>Backup Field Excursion</b>	
Week 8	Mark Lackie	L15	Introduction to electrical methods	<i>External Quiz 2</i> Two layer Resistivity prac
		L16	Methods of electrical surveying	
			<b>Possible Field Excursion</b>	
Week 9	Mark Lackie	L17	Induced Polarization, self potential	Field data intro *Three layer Resistivity
		L18	Electromagnetic exploration	
			<b>***Field Excursion</b>	
Week 10	Mark Lackie	L19	Palaeomagnetism	*Field data Compilation
		L20	Reversals, geomagnetic time scale	

Week 11	Mark Lackie	L21	Radiometric surveying	*Field data
	Craig O'Neill	L22	Geothermics	Compilation
Week 12	Mark Lackie	L23	GPS	*Field data
		L24	Exploration Geophysics	Compilation
Week 13	Craig O'Neill	L25	Geophysics of the Lithosphere	<i>External Quiz 3</i>
		L26	Satellite Geophysics	Fielddata Compilation

## 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](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](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/](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](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](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/](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](http://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](http://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](http://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/](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

- understanding of the basic concepts of geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;
- gaining experience in modelling geophysical data;
- understanding scientific methodology;



- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and

## **Assessment tasks**

- Assignments
- Quizzes
- 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**

- understanding of the basic concepts of geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;
- gaining experience in modelling geophysical data;
- understanding scientific methodology;
- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and

### **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 geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;

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

## **Assessment tasks**

- Assignments
- Quizzes
- 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 geophysics;
- understanding scientific methodology;
- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and

## **Assessment tasks**

- Assignments
- Quizzes
- Examination

## **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 geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;
- gaining experience in modelling geophysical data;
- understanding scientific methodology;
- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and
- capacity to present ideas clearly with supporting evidence

## Assessment tasks

- Assignments
- Quizzes
- Field Report
- Examination

## 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 geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;
- gaining experience in modelling geophysical data;
- understanding scientific methodology;
- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and
- capacity to present ideas clearly with supporting evidence

## Assessment tasks

- Assignments
- Quizzes
- Field Report

- Examination

## 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 geophysics;
- gaining experience in operating geophysical equipment;
- gaining experience in interpreting geophysical data;
- gaining experience in modelling geophysical data;
- understanding scientific methodology;
- competence in accessing, using and synthesising appropriate information;
- application of knowledge to solving problems and evaluating ideas and information; and
- capacity to present ideas clearly with supporting evidence

### Assessment tasks

- Field Report
- Examination

## Changes from Previous Offering

Updated assessment, schedule and delivery and resources.