GEOS205

Introduction to Geophysics

S1 Day 2016

Dept of Earth and Planetary Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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Lecturer
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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
Quizzes	24%	TBA
Field Report	26%	5/6/15
Examination	50%	University Examination Period

Quizzes

Due: **TBA**
Weighting: **24%**

There will be five (5) quizzes held during the Session, at intervals of two to three weeks. The results from the best four (4) quizzes will count towards the final mark, each worth 6% of the final assessment. The quizzes will consist of short answer or multiple choice questions relating to the practical work and 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: **5/6/15**
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
Week 1	Mark Lackie	L1 L2	Introduction Wave motion and seismic waves	Seismic waves
Week 2	Mark Lackie	L3 L4	Seismographs and Travel time curves Earthquakes	Earthquake Interpretation
Week 3	Mark Lackie Craig O'Neill	L5 L6	Seismic exploration GPR	*Quiz 1* GPR & Refraction Interpretation

Week 4	Mark Lackie	L7 L8	Gravity: Fundamental principles Reduction of gravity data	*External Quiz 1* Reduction of Gravity Data
Week 5	Mark Lackie Craig O'Neill	L9 L10	Modelling and Interpretation of gravity data Isostasy	*Quiz 2* Gridding & Isostasy
Week 6	MarkLackie	L11 L12	Physics of magnetism The earth's magneticfield	*Gravity Modelling
			Mid SemesterRecess **External Residential**	
Week 7	Mark Lackie	L13 L14	Magnetic Surveying Techniques Interpretation of magnetic data	*Magnetic Modelling
			Backup Field Excursion	
Week 8	Mark Lackie	L15 L16	Introduction to electrical methods Methods of electrical surveying	*Quiz 3* *External Quiz 2* Two layer Resistivity prac
			****Field Excursion**	
Week 9	MarkLackie	L17 L18	Induced Polarization,selfpotential Electromagnetic exploration	Field data intro *Three layer Resistivity
			****Field Excursion**	
Week 10	Mark Lackie	L19 L20	Palaeomagnetism Reversals, geomagnetic time scale	*Quiz 4* *Field data Compilation
Week 11	Mark Lackie Craig O'Neill	L21 L22	Radiometric surveying Geothermics	*Field data Compilation
Week 12	Mark Lackie	L23 L24	GPS Exploration Geophysics	*Field data Compilation
Week 13	Craig O'Neill	L25 L26	Geophysics of the Lithosphere Satellite Geophysics	*Quiz 5* *External Quiz 3* Field data 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

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

- 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

- 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;
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Assessment task

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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;
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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

- 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;
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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;
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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

- 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;
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Changes from Previous Offering

Updated assessment and updated Schedule and Delivery and Resources.