GEOS791

Advanced Potential Field Methods

S2 Day 2015

Dept of Earth and Planetary Sciences

Contents

General Information

Unit convenor and teaching staff
Mark Lackie
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Credit points
4

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit comprises study of an advanced topic in earth and planetary sciences. The area studied each year is tailored to the current student cohort. Emphasis is on both the understanding of advanced concepts as well as their application in problem-solving and/or research environments.

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. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
2. Competence in accessing, using and synthesising appropriate information.
3. Application of knowledge to solving problems and evaluating ideas and information.
4. Capacity to present ideas clearly with supporting evidence.
5. Knowledge of how to image and enhance potential field data.
6. Knowledge of how to apply forward and inverse modelling techniques to better interpret geological structures imaged by potential field data.

Assessment Tasks

Name	Weighting	Due
Assignment I	10%	Week 4
Assignment II	10%	Week 6
Assignment III	20%	Week 10
Oral Presentation	10%	Week 11
Assignment IV	20%	Week 12
Final Report	30%	Week 13

Assignment I

Due: **Week 4**
Weighting: **10%**

Assignment based on initial practical and theory work.

On successful completion you will be able to:

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 2. Competence in accessing, using and synthesising appropriate information.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
- 4. Capacity to present ideas clearly with supporting evidence.
- 5. Knowledge of how to image and enhance potential field data.

Assignment II

Due: **Week 6**
Weighting: **10%**

Assignment based on initial practical and theory work.

On successful completion you will be able to:

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 2. Competence in accessing, using and synthesising appropriate information.
- 3. Application of knowledge to solving problems and evaluating ideas and information.

- 4. Capacity to present ideas clearly with supporting evidence.
- 5. Knowledge of how to image and enhance potential field data.

Assignment III

Due: **Week 10**
Weighting: **20%**

Assignment based on practical and theory work.

On successful completion you will be able to:

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
- 4. Capacity to present ideas clearly with supporting evidence.
- 5. Knowledge of how to image and enhance potential field data.
- 6. Knowledge of how to apply forward and inverse modelling techniques to better interpret geological structures imaged by potential field data.

Oral Presentation

Due: **Week 11**
Weighting: **10%**

Oral presentation on a topic relevant to the content.

On successful completion you will be able to:

- 2. Competence in accessing, using and synthesising appropriate information.
- 4. Capacity to present ideas clearly with supporting evidence.

Assignment IV

Due: **Week 12**
Weighting: **20%**

Assignment based on practical and theory work.

On successful completion you will be able to:

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
- 4. Capacity to present ideas clearly with supporting evidence.
- 5. Knowledge of how to image and enhance potential field data.

- 6. Knowledge of how to apply forward and inverse modelling techniques to better interpret geological structures imaged by potential field data.

Final Report

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

Each student will undertake a detailed analysis of potential field data from a site within Australia. Each student will write a report about the findings of the analysis and give a presentation of those findings.

On successful completion you will be able to:

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 2. Competence in accessing, using and synthesising appropriate information.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
- 4. Capacity to present ideas clearly with supporting evidence.
- 5. Knowledge of how to image and enhance potential field data.
- 6. Knowledge of how to apply forward and inverse modelling techniques to better interpret geological structures imaged by potential field data.

Delivery and Resources

The textbooks for the unit are:

Aeromagnetic Surveys: Principles, Practice & Interpretation by Colin Reeves.

This book is freely available as a pdf and can be found at the following website.

http://www.geosoft.com/media/uploads/resources/technical-papers/Aeromagnetic_Survey_Reeves.pdf

Fundamentals of Gravity Exploration by Thomas LaFehr and Misac Nabighian

This book can be obtained from the SEG website

http://www.seg.org/seg

Also, the following book may be of interest.

Gravity and Magnetic Exploration: Principles, Practices and Applications by Hinze, Von Frese and Saad. (e-book in library)

The iLearn site will have the reference list from GEOS205, which contains an extensive list of geophysical texts held in the library.

Unit Schedule

Topic 1 Review of Material

Topic 2 Filtering and Imaging of gravity and magnetic fields

Topic 3 Regional-residual separation

Topic 4 Limitations of profile modelling of gravity and magnetic data

Topic 5 Non-uniqueness and advantages of constrained inversions

Topic 6 Inversion of enhancements of gravity and magnetic fields

Topic 7 Remanence

Topic 8 Depth to magnetic source estimation

Topic 9 Modelling and interpretation of Free-Air and Bouguer Gravity

Topic 10 Gravity modelling of a single density contrast interface

Topic 11 Modelling gravity lows –discrimination between basins and granites

Topic 12 The significance of Poisson's relationship in combined interpretation of gravity and magnetic data

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

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 2. Competence in accessing, using and synthesising appropriate information.
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- 4. Capacity to present ideas clearly with supporting evidence.
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Assessment tasks

- Assignment I
- Assignment II
- Assignment III
- Assignment IV
- Final Report

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 2. Competence in accessing, using and synthesising appropriate information.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
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- Assignment II
- Assignment III

- Oral Presentation
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PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcome

- 6. Knowledge of how to apply forward and inverse modelling techniques to better interpret geological structures imaged by potential field data.

Assessment tasks

- Assignment III
- Oral Presentation
- Assignment IV
- Final Report

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
- 4. Capacity to present ideas clearly with supporting evidence.
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PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- 1. Acquire a coherent and advanced knowledge of the principles and concepts of potential field methods.
- 2. Competence in accessing, using and synthesising appropriate information.
- 3. Application of knowledge to solving problems and evaluating ideas and information.
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