



# GEOS207

## Field and Laboratory Studies in Geoscience

S1 Day 2018

*Dept of Earth and Planetary Sciences*

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#### **Disclaimer**

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## General Information

### Unit convenor and teaching staff

Convenor

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Credit points

3

Prerequisites

GEOS125

Corequisites

Co-badged status

Unit description

This skills-based unit integrates projects, lectures and laboratory classes to develop theoretical knowledge and hands-on experience needed to describe and interpret rocks in the field and laboratory. Field methods involve aerial photograph interpretation, representation of three-dimensional structural data and observations of rock types, rock structures and the relationship between geology and topography. Laboratory methods include geological map interpretation, optical and electron microscopy and geochemical data analysis. The field and laboratory skills are combined to complete an integrated forensic science case study.

## 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. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
2. Develop the skills needed to typify the bedrock controls on landforms and

geomorphology

3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
4. Develop the skills needed to interpret the significance of microstructures in geoscience materials
5. Develop the skills needed to undertake projects of a complex nature
6. Develop the skills needed to describe and analyse simple field structures.
7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
8. Understand how to apply geoscientific principles to understanding the world around you
9. Understand how to access, use and synthesise appropriate information
10. Develop effective team work skills
11. Understand how to present ideas clearly with supporting evidence in a number of formats

## General Assessment Information

The assessment consists of several components:

Case study 15%

Online quizzes 5%

Online Open University course 10%

Field Trip 20%

Final examination 50%

If you receive [special consideration](#) for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the [policy](#) prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn ([bit.ly/FSESupp](http://bit.ly/FSESupp)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Forensic science part 1</a>	5%	No	23th of April

Name	Weighting	Hurdle	Due
<a href="#">Forensic science part 2</a>	10%	No	14th of May (week 10)
<a href="#">Open University Online Course</a>	10%	No	various
<a href="#">Online Quizzes</a>	5%	No	each week
<a href="#">Final Examination</a>	50%	No	Week 13
<a href="#">Field Trip</a>	20%	No	during field trip

## Forensic science part 1

Due: **23th of April**

Weighting: **5%**

Part 1: Online quiz – download the questions, make the calculations (mineral classifications from data plotting) and then complete the quiz

On successful completion you will be able to:

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
- 4. Develop the skills needed to interpret the significance of microstructures in geoscience materials
- 5. Develop the skills needed to undertake projects of a complex nature
- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around you
- 9. Understand how to access, use and synthesise appropriate information
- 10. Develop effective team work skills
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## Forensic science part 2

Due: **14th of May (week 10)**

Weighting: **10%**

### **Part 2: Rock table, XRF data, petrographic description and report.**

o Complete the table downloadable from iLearn, with the descriptive geologic sample names (e.g. biotite-muscovite schist) you have determined for the unknown rocks from your petrographic analysis and which unit it most likely matches on the geologic map (if any)

o Plot the XRF data onto the exploration classification figure provided o Write one full petrographic description – with copious illustrations

### **Report: Interpretation of your main results in the form of a two-page report to the police**

o The two-page report should piece together the one page from the victim's notebook, the geophysics interpretation, the thin sections, the sand samples and XRF data. Some questions to consider:

- How many unique rock types are there?
- What are the rock types and their mineralogy?
- Why, in your opinion, did the geologist have that rock in their car?
- Do any of the rocks match the murder weapon or those used to weigh down the body?
- Does any of the rock analysis help with motive or piecing together the how/where/when of the murder and disposal of the body?
- What were the various sand grains?
- Are they specific to any of the samples analysed petrographically or on the map or have they been kicking around the Earth's surface for a while (stable)?
- Does any of the sand help with motive or piecing together the how/where/when of the murder and disposal of the body?
- Who should the police arrest and why?
- Is there a consistent story or are there multiple options?
- What further investigations or queries should the police make and why?
- If given more time and a further \$10,000 consulting fee (wow – you are expensive), what further analyses might you do to clinch a conviction for the police once an arrest was made?
- N.B. Marks will be deducted for reports that are too long – clear and succinct writing is an important skill, valued by professionals. It may take you a few drafts to rewrite your text and fit all of the information into the page limit.

On successful completion you will be able to:

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 5. Develop the skills needed to undertake projects of a complex nature
- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around you
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## Open University Online Course

Due: **various**

Weighting: **10%**

**An introduction to minerals and rocks under the microscope** - Free online course offered by the Open University (UK)

<http://www.open.edu/openlearn/science-maths-technology/science/introduction-minerals-and-rocks-under-the-microscope/content-section-0?active-tab=description-tab>

You will have to enrol online for this, enrolment is free of charge.

This course consist of three parts.

Part 1 is due Monday 05 March 5pm (hand in screenshot), take online quiz

Part 2 is due Monday 19 March 5pm (hand in screenshot), takes online quiz

Part 3 is due Thursday 29 March 5pm (hand in statement of participation), take online quiz

60% of the mark will be given for completion of the course and 40% or the mark will be based on the online quizzes covering the content of the course

On successful completion you will be able to:

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 10. Develop effective team work skills
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## Online Quizzes

Due: **each week**

Weighting: **5%**

There will be a series of online quizzes in several weeks. The questions are drawn from the information given in lectures. You will be required to complete a Virtual Petrographic Microscope task each week and submit your answers in the weekly quiz.

On successful completion you will be able to:

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
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## Final Examination

Due: **Week 13**

Weighting: **50%**

The final exam will cover material from the lectures, class practical exercises and case studies. Questions will draw on information and ideas from the whole unit to give an integrated view of the unit. The exam will include questions that ask you to apply your knowledge to interpret and solve problems. You will be allowed to take one A4 page of notes into the exam, otherwise it is closed book.

On successful completion you will be able to:

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 11. Understand how to present ideas clearly with supporting evidence in a number of formats



## Field Trip

Due: **during field trip**

Weighting: **20%**

A field guide and detailed assessment tasks will be provided prior to field trip

On successful completion you will be able to:

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 4. Develop the skills needed to interpret the significance of microstructures in geoscience materials
- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around you
- 10. Develop effective team work skills
- 11. Understand how to present ideas clearly with supporting evidence in a number of formats

## Delivery and Resources

This unit can be seen as three interconnected streams. A lecture stream will give a broad overview of the topics, provide background information and introduce new ideas and concepts that link in with the laboratory practical and case study streams.

There will be one case study submitted in parts throughout the semester. The case study is an extended enquiry into a real geo-scientific problem. This problem is different to the ones that you would typically find in textbooks, and more closely resembles the investigations that scientists face in the real world, with many interacting factors and a number of possible solutions.

The case study will allow you to explore the ideas in depth and will provide an effective and, we hope, enjoyable method of learning. There is also the added benefit of providing you with opportunities to develop generic skills and graduate capabilities such as problem solving, teamwork, communication, accessing and evaluating information and in using scientific approaches to solve problems.

You will be working individually for the case study, both in attempting to solve the problem and to produce a final report. However, you are encouraged to consult with others in the class and to help each other with the work, although, final reports should be done individually. You will

be expected to do substantial research outside of the scheduled time (e.g. library and/or web-based literature search, data processing and plotting).

Technology that we will use involves laboratory equipment including petrographic microscopes and geochemical instruments housed in Macquarie Geoanalytical.

### **Time Allocation**

According to Macquarie University guidelines, you are required to spend 39 hours of study per credit point. For GEOS207 this works out to approximately four hours per week at the lecture/laboratory sessions, and approximately six hours per week doing at home study.

Conscientious use of this time, particularly if it is spread over the whole semester will provide its reward.

## **Policies and Procedures**

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway \(https://students.mq.edu.au/support/study/student-policy-gateway\)](https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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.m](#)

[mq.edu.au](http://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

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 9. Understand how to access, use and synthesise appropriate information
- 10. Develop effective team work skills

- 11. Understand how to present ideas clearly with supporting evidence in a number of formats

## **Assessment tasks**

- Forensic science part 1
- Field Trip

## **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**

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
- 4. Develop the skills needed to interpret the significance of microstructures in geoscience materials
- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 10. Develop effective team work skills

## **Assessment tasks**

- Forensic science part 1
- Forensic science part 2
- Open University Online Course
- Field Trip

## **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**

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
- 5. Develop the skills needed to undertake projects of a complex nature
- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around you
- 9. Understand how to access, use and synthesise appropriate information

## **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. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around you
- 9. Understand how to access, use and synthesise appropriate information
- 11. Understand how to present ideas clearly with supporting evidence in a number of formats

## **Assessment tasks**

- Forensic science part 1
- Forensic science part 2
- Open University Online Course
- Online Quizzes
- Final Examination
- Field Trip

## **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. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around

you

- 9. Understand how to access, use and synthesise appropriate information
- 11. Understand how to present ideas clearly with supporting evidence in a number of formats

## **Assessment tasks**

- Forensic science part 1
- Forensic science part 2
- Open University Online Course
- Online Quizzes
- Final Examination
- Field Trip

## **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. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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- 8. Understand how to apply geoscientific principles to understanding the world around you
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- 11. Understand how to present ideas clearly with supporting evidence in a number of

formats

## Assessment tasks

- Forensic science part 1
- Forensic science part 2
- Open University Online Course
- Online Quizzes
- Final Examination
- Field Trip

## 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. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 2. Develop the skills needed to typify the bedrock controls on landforms and geomorphology
- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
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## Assessment tasks

- Forensic science part 1
- Forensic science part 2
- Open University Online Course
- Field Trip

## Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

## Learning outcomes

- 1. Develop the skills needed to select appropriate techniques to characterise and analyse geoscience materials (e.g. rocks, minerals, soils, etc)
- 4. Develop the skills needed to interpret the significance of microstructures in geoscience materials
- 5. Develop the skills needed to undertake projects of a complex nature
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 10. Develop effective team work skills

## Assessment tasks

- Forensic science part 1
- Forensic science part 2
- Open University Online Course

## Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

## Learning outcomes

- 2. Develop the skills needed to typify the bedrock controls on landforms and

geomorphology

- 3. Develop the skills needed to utilise the power of back-scattered electron microscopy and petrographic microscopic analysis of thin sections
- 4. Develop the skills needed to interpret the significance of microstructures in geoscience materials
- 5. Develop the skills needed to undertake projects of a complex nature
- 6. Develop the skills needed to describe and analyse simple field structures.
- 7. Develop the skills needed to interpret cross-cutting relationships in the field and laboratory to determine the sequence of geoscience events for a given problem
- 8. Understand how to apply geoscientific principles to understanding the world around you
- 10. Develop effective team work skills

## **Assessment tasks**

- Forensic science part 1
- Forensic science part 2
- Open University Online Course