UNSW Course Outline

GEOS2181 Earth Materials - 2024

Published on the 20 May 2024

General Course Information

Course Code : GEOS2181
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Biological, Earth and Environmental Sciences
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course is an introduction to the identification, classification, analysis and formation of rocks (igneous, sedimentary and metamorphic) and minerals, with special reference to the rock-forming minerals. Also included are extraterrestrial materials and gem minerals, including Australia's national gemstone, opal. Lectures and lab classes will also cover mineral and rock

analysis techniques, an introduction to geochemistry, radiometric dating, volcanic processes and products, X-ray diffraction, and optical properties of minerals and rocks under the polarizing microscope.

There is a one-day fieldtrip associated with this course to the near South Coast of NSW during which you will learn a variety of general geological field techniques. For this trip, you will have to contribute to the cost of bus/coach hire for the day.

This is a core course for the Earth Sciences major and covers the broad fields of mineralogy and petrology which are fundamental for further courses in Earth Sciences. Students will synthesise the knowledge and tools gained to solve problems using real-world examples.

Assumed knowledge: GEOS1111.
This course is a prerequisite for GEOS3141.

Course Aims

The overall aim of this course is to provide a theoretical and practical introduction to the scientific study of minerals (mineralogy) and rocks (petrology), and to the principal techniques for mineralogical, petrological and geochemical analysis. The course content and activities will provide an understanding of the nature and origin of minerals, rocks and sediments, as a basis for further studies in the Earth and Environmental Sciences.

Relationship to Other Courses

This course is fundamental for further studies in the Earth and Environmental Sciences and is of great advantage for Civil and Mining Engineering students.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Assess and identify rock-forming minerals in both hand specimen and thin-section.
CLO2 : Select and apply the appropriate techniques to identify a given mineral in the field or in the lab.
CLO3 : Identify common igneous and sedimentary rocks in hand-specimen and thin-section
CLO4 : Apply problem-solving skills to determine the broad formation and evolution of igneous and sedimentary rocks using a wide variety of field and laboratory techniques.
CLO5 : Discuss the characteristics , properties and formation of minerals and rocks using appropriate scientific terminology, diagrams, models and referencing.

Course Learning Outcomes	Assessment Item
CLO1 : Assess and identify rock-forming minerals in both hand specimen and thin-section.	• Weekly quizzes • Field Trip Report • Lab test • Final Exam
CLO2 : Select and apply the appropriate techniques to identify a given mineral in the field or in the lab.	• Weekly quizzes • Final Exam
CLO3 : Identify common igneous and sedimentary rocks in hand-specimen and thin-section	• Field Trip Report • Lab test • Weekly quizzes • Final Exam
CLO4 : Apply problem-solving skills to determine the broad formation and evolution of igneous and sedimentary rocks using a wide variety of field and laboratory techniques.	• Field Trip Report • Final Exam
CLO5 : Discuss the characteristics , properties and formation of minerals and rocks using appropriate scientific terminology, diagrams, models and referencing.	• Lab test • Weekly quizzes • Field Trip Report • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

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Additional Course Information

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Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Weekly quizzes Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Not Applicable
Field Trip Report Assessment Format: Individual	10%	Start Date: 04/07/2023 05:00 PM Due Date: 23/07/2023 11:59 PM
Lab test Assessment Format: Individual	20%	Start Date: 02/08/2023 01:00 PM Due Date: 02/08/2023 03:00 PM
Final Exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Weekly quizzes

Assessment Overview

You will answer 8 weekly quizzes at the start of each lab class (except for week 1). These are multiple choice, closed book and comprise 20 questions. Quizzes 1-7 are worth 2% each while the final quiz 8 is a revision of the whole course and is worth 6%. The questions will be based upon both lecture and laboratory content.

Feedback is provided at the start of the following lab class.

Course Learning Outcomes

- CLO1 : Assess and identify rock-forming minerals in both hand specimen and thin-section.
- CLO2 : Select and apply the appropriate techniques to identify a given mineral in the field or in the lab.
- CLO3 : Identify common igneous and sedimentary rocks in hand-specimen and thin-section
- CLO5 : Discuss the characteristics , properties and formation of minerals and rocks using appropriate scientific terminology, diagrams, models and referencing.

Detailed Assessment Description

1 mark for each correct answer

Assessment Length

~ 10 minutes, weekly during lab time

Submission notes

Quiz conducted in class on paper. Marks returned the follow lab

Assessment information

0

Assignment submission Turnitin type

This is not a Turnitin assignment

Field Trip Report

Assessment Overview

You will be expected to write a report on the geological relationships of the outcrops that you will be shown in the field and how these relate to the geological evolution of the Sydney Basin. The report should be roughly 1500 words (3000 words max.), including figures, tables and references. You will use the knowledge that you have learned from lectures and laboratory classes both during the fieldtrip itself and in the writing of your report. You will be given both a report outline and a published paper in the class to guide you with the referencing style and format.

Report is due at end of week 9. Feedback will be provided to the group in the laboratory at the end of Week 10 through a marked rubric with annotated comments.

Course Learning Outcomes

- CLO1 : Assess and identify rock-forming minerals in both hand specimen and thin-section.
- CLO3 : Identify common igneous and sedimentary rocks in hand-specimen and thin-section
- CLO4 : Apply problem-solving skills to determine the broad formation and evolution of igneous and sedimentary rocks using a wide variety of field and laboratory techniques.
- CLO5 : Discuss the characteristics , properties and formation of minerals and rocks using appropriate scientific terminology, diagrams, models and referencing.

Detailed Assessment Description

Full marks for well illustrated, set-out, formatted and answered report, along with at least 6 scientific journal references

Assessment Length

Roughly 1500 words (3000 words max.)

Assessment information

0

Assignment submission Turnitin type

This is not a Turnitin assignment

Lab test

Assessment Overview

You will be expected to complete a laboratory skills test during the last laboratory class in week 10. In this exam, you simply need to name the appropriate mineral or rock that is numbered before you, either in hand-specimen or in thin-section. You will be given a simple fill-in sheet for this. This practical exam will be of 2 hours duration.

Feedback will be provided on an individual basis anytime after the exam through direct inquiry to course coordinator.

Course Learning Outcomes

- CLO1 : Assess and identify rock-forming minerals in both hand specimen and thin-section.
- CLO3 : Identify common igneous and sedimentary rocks in hand-specimen and thin-section
- CLO5 : Discuss the characteristics , properties and formation of minerals and rocks using appropriate scientific terminology, diagrams, models and referencing.

Detailed Assessment Description

1 full mark for each correctly named mineral and rock sample.

Assessment Length

Not applicable

Assessment information

Fill-in answer sheet will be provided.

Assignment submission Turnitin type

This is not a Turnitin assignment

Final Exam

Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across the term, including material from lectures, laboratory classes and fieldwork. The exam is typically 2hrs 10 minutes and consists of MCQ, short numerical and short answer responses - details will be confirmed during the course. The examination will occur during the official university examination period. Feedback is available through individual inquiry with the course convenor.

Hurdle requirement: must achieve 50% to receive a passing grade in the course.

Course Learning Outcomes

- CLO1 : Assess and identify rock-forming minerals in both hand specimen and thin-section.
- CLO2 : Select and apply the appropriate techniques to identify a given mineral in the field or in the lab.
- CLO3 : Identify common igneous and sedimentary rocks in hand-specimen and thin-section
- CLO4 : Apply problem-solving skills to determine the broad formation and evolution of igneous and sedimentary rocks using a wide variety of field and laboratory techniques.
- CLO5 : Discuss the characteristics , properties and formation of minerals and rocks using appropriate scientific terminology, diagrams, models and referencing.

Detailed Assessment Description

Full marks for each correctly answered question. Details of assessment given on exam sheet.

Assessment information

None

Assignment submission Turnitin type

This is not a Turnitin assignment

General Assessment Information

Assessment 1:

Weekly quizzes

Answer 20 multiple-choice questions

Quiz: 1-7: 2 marks each, Quiz 8: (revision quiz) 6%

Assessment 2:

Fieldtrip report

Write in less than 2000 words a properly formatted and well-illustrated report outlining the key geological relationships that you have seen and how these relate to the geological evolution of the Sydney Basin

Assessment 3:

Lab Test

Simply name the mineral or rock in hand-specimen or thin-section

Assessment 4:

Final Exam

Answer all of Sections A and B and any three questions From Sections C and D

Grading Basis

Standard

Requirements to pass course

Overall mark of over 50.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Tue 28 May: L1 Getting to know each other and course overview, Mathews C 11-12
	Lecture	Thu 30 May: L2 Intoroduction to Mineralogy, Mathews C 2-3
	Lecture	Fri 31 May: L3 Optical Mineralogy, (recorded online)
	Laboratory	Tue 28 May 1-3 Lab 1 Minerals 1
	Laboratory	Wed 29 May 2-4 Lab 2 Minerals II
Week 2 : 3 June - 9 June	Lecture	Tue 4 June: L4 Introduction to Geochemistry, Mathews C 11-12
	Lecture	Thu 6 June: L5 Mineral Groups, Mathews C 2-3
	Lecture	Fri 7 June: L6 Analytical techniques (recorded online)
	Laboratory	Tue 4 June 1-3 Lab 3 Minerals III and Introduction to Petrography
	Laboratory	Wed 5 June 2-4 Lab 4 Thin sections I
	Assessment	Wed 5 June 2-4 Quiz 1: Properties of minerals in hand-specimen
Week 3 : 10 June - 16 June	Lecture	Tue 11 June: L7 Opal – Australia's national gemstone, Mathews C 11-12
	Lecture	Thu 13 June: L7 Igneous Processes, Mathews C 2-3
	Lecture	Fri 14 June: L9 Classifying and naming igneous rocks (recorded online)
	Laboratory	Tue 11 June 1-3 Lab 5 Thin sections II
	Laboratory	Wed 12 June 2-4 Lab 6 Opals and thin sections III
	Assessment	Wed 12 June 2-4 Quiz 2: Introduction to Geochemistry/Introduction to Mineralogy
Week 4 : 17 June - 23 June	Lecture	Tue 28 June: L10 Magma formation and evolution, Mathews C 11-12
	Lecture	Thu 20 June: L11: Volcanoes and their products I, Mathews C 2-3
	Lecture	Fri 21 June: L12 Volcanoes - case examples (recorded online)
	Laboratory	Tue, 18 June 1-3 Lab 7 Igneous rocks I
	Laboratory	Wed, 19 June 2-4 Lab 8 Igneous rocks II
	Assessment	Wed, 19 June 2-4 Quiz 3: Mineral Groups/Optical Mineralogy
Week 5 : 24 June - 30 June	Lecture	Tue 25 June: L13 Volcanoes and their products II, Mathews C 11-12
	Lecture	Thu 27 June: L13 Cenozoic volcanism in eastern Australia, Mathews C 2-3
	Lecture	Fri 28 June: L15 Geochronology (recorded online)
	Laboratory	Tue, 25 June 1-3 Lab 9 Igneous rocks III
	Laboratory	Wed 26 June 2-4 Lab 10 Igneous rocks IV
	Assessment	Wed 26 June 2-4 Quiz 4: Properties of minerals in thin-section
Week 6 : 1 July - 7 July	Fieldwork	WEEK 6: BREAK (3-9 July), Monday 1 July - optional fieldtrip to Gerringong
Week 7 : 8 July - 14 July	Lecture	Tue 9 July: L16 Gem Materials, Mathews C 11-12
	Lecture	Thu 11 July: L17 X-ray diffraction and micro-analysis, Mathews C 2-3
	Lecture	Fri 12 July: L18 Clays and Clay Minerals (recorded online)
	Laboratory	Tue 9 July 1-3 Lab 11 Using geochemical data
	Laboratory	Wed 10 July 2-4 Lab 12 XRD techniques
	Assessment	Wed 10 July 2-4

		Quiz 5: Igneous processes/Classification and naming of igneous rocks/ Volcanoes and their hazards
Week 8 : 15 July - 21 July	Lecture	Tue 16 July: L19 Sedimentary processes and materials, Mathews C 11-12
	Lecture	Thu 18 June: L20: Clastic non-carbonate sedimentary rocks, Mathews C 2-3
	Lecture	Fri 19 July: L21 Carbonate sedimentary rocks (recorded online)
	Laboratory	Tue, 16 July 1-3 Lab 13 Clastic non-carbonate sedimentary rocks I
	Laboratory	Wed, 17 July 2-4 Lab 14 Clastic non-carbonate sedimentary rocks II
	Assessment	Wed, 17 July 2-4 Quiz 6: Analytical techniques/Geochronology/Gem materials
Week 9 : 22 July - 28 July	Lecture	Tue 23 July: L22 Early Earth, Mathews 11-12
	Lecture	Thu 25 July: L23 Extraterrestrial Materials, Mathews C 2-3
	Lecture	Fri 26 July: L24 Sedimentary rocks of the Sydney Basin (recorded online)
	Laboratory	Tue, 23 July 1-3 LAB 15 Carbonate sedimentary rocks
	Laboratory	Wed 24 July 2-4 Lab 16 Metamorphic minerals
	Assessment	Wed 24 July 2-4 Quiz 7: Sedimentary processes and rocks
Week 10 : 29 July - 4 August	Lecture	Tue 1 August: L25 Introduction to Metamorphism, Mathews C 11-12
	Lecture	Thu 3 August: L26 Course revision and final exam, Mathews C 2-3
	Lecture	Friday 26 July Lecture 26: regional metamorphism (recorded online)
	Laboratory	Tue, 1 August 1-3 LAB 17 Metamorphic rocks
	Laboratory	Wed, 2 August 2-4 Lab 17 Final Quiz and Practical test
	Assessment	Wed 2 August 2-4 Quiz 8: Revision of whole course
	Assessment	Lab Test 2-4 Wednesday 2nd August

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

Provided on a week by week basis (see course schedule and also course outline handed-out to students

Course Resources

Prescribed Resources

All given to students through Moodle or handed out in class

Recommended Resources

Mineralogy **Klein, C., and Dutrow, B., 2008.** *The Manual of Mineral Science* (23rd Edition). John Wiley and Sons.

Klein, C., 2008. *Minerals and Rocks* (3rd Edition). John Wiley and Sons.

Deer, W.A, Howie, R.A. and Zussman, J., 1992. *Introduction to the Rock Forming Minerals*. Longman.

Wenk, H-R., and Bulakh, A., 2004. *Minerals: their constitution and origin.* Cambridge University Press.

Optical Mineralogy **Nesse, W.D., 2004.** *Introduction to Optical Mineralogy* (3rd Edition). Oxford University Press.

Gribble, C.D., and Hall, A.J., 1985. *A Practical Introduction to Optical Mineralogy*. George Allen and Unwin.

MacKenzie, W.S. and Guildford, C., 1980. *Atlas of Rock-forming Minerals in Thin Section,* Longman

MacKenzie, W.S. and Adams, A.E., 2000. *A Colour Atlas of Rocks and Minerals in Thin Section*. Manson Publishing.

Perkins, D. and Henke, K.R., 2004. *Minerals in Thin Section* (Second Edition). Pearson Education Inc.

Crystals **Sunagawa, I., 2005.** *Crystals: growth, morphology and perfection*. Cambridge University Press.

Clay Mineralogy **Velde, B., 1992**. *Introduction to Clay Minerals*. Chapman and Hall.

Earth Materials **Klein, C., and Philpotts, A., 2013**. Earth materials: Introduction to Mineralogy and Petrology. Cambridge University Press.

Sediment. Petrology **Tucker, M.E., 1981.** *Sedimentary Petrology: an introduction.* Blackwells Scientific.

Boggs, S., 1992. *Petrology of sedimentary rocks*. Macmillan Press.

Igneous Petrology **McBirney, A.R., 2007.** *Igneous Petrology* (3rd Edition). Jones and Bartlett.

General Petrology **Blatt, H., Tracey, R.J. and Owens, B.E., 2006**. *Petrology: Igneous,*

Sedimentary and Metamorphic (Third Edition). W.H. Freeman

Geochemistry **Dickin, A.P., 2000**. *Radiogenic Isotope Geology*. Cambridge University Press.

Faure, G., 2001. *Origin of Igneous Rocks: the isotopic evidence*. Springer.

Faure, G., 2003. *Principles and Applications of Isotope Geochemistry*. Macmillan.

Rollinson, H., 1993. *Using Geochemical Data: evaluation, presentation and interpretation*. Longman Scientific.

Useful Web Sites:

Links for Mineralogists, University of Wurzburg:

http://www.uni-wuerzburg.de/mineralogie/links.html

University of Oxford (Dave Waters), Mineralogy Links:

http://www.earth.ox.ac.uk/~davewa/minerals.html

Mineralogical data base:

http://www.mindat.org

Additional Costs

There is a day field trip on Tuesday Week 6. Students will incur ~$30 cost.

Course Evaluation and Development

In my first lecture I discuss changes to the course based on previous feedback from students.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Ian Graham		Building F25, Room 131	9385 8720	Email Ian to arrange a meeting time.	Yes	Yes
Lab staff	Mira van der Ley		Building E26, Room LG015	9385 8030	Mira will be available during lab times and can provide access to the lab if students would like to review the specimens	No	No
Head lecturer	Ian Graham		Building F25, room 131	93858720	Contact via email	Yes	No

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others'

ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.
Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: UNSW has a "fit to sit/submit" rule, which means that if you sit an exam or

submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre
- Science EDI Student Initiatives, Offerings and Guidelines