GEOS125

Earth Dynamics

S2 External 2013

Earth and Planetary Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
Juan Carlos Afonso
juan.afonso@mq.edu.au
Contact via juan.afonso@mq.edu.au
E7A523
Send email to book time

Credit points
3

Prerequisites

Corequisites

Co-badged status

Unit description
Discover how the solid Earth works â€“ investigate the dynamic link between plate tectonics and Earth evolution. This introductory unit is suitable for all students including those wanting to try a natural science. It explores the composition and structure of our planet and the dynamic processes that change our environment. Students become skilled at geoscience techniques that permit detailed study of the Earth and explore via case studies modern sedimentary environments; volcanoes and volcanic hazards; and economic geology. The unit provides a strong background in geoscience for further studies in geology, geophysics, geography, museum studies, geomorphology, soils, astronomy and environmental science; and insights into Earth materials and their relationship to the environment for students of economics, physics, archaeology, chemistry, biology, marine science and education. This unit involves eye-opening field trips in tutorial classes around campus and a day trip across the Blue Mountains.

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 tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress

Competence in applying geo-scientific principles to understanding the world around you
Capacity to employ appropriate geo-scientific tools to solve problems and to interpret the results
Understanding scientific methodology
Competence in accessing, using and synthesising appropriate information
Application of knowledge to solving problems and evaluating ideas and information
Capacity to present ideas clearly with supporting evidence

Assessment Tasks

Name	Weighting	Due
Weekly quiz	10%	Weekly
Case studies	45%	TBA
Final examination	45%	University Examination Period

Weekly quiz

Due: **Weekly**
Weighting: **10%**

On successful completion you will be able to:

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Competence in applying geo-scientific principles to understanding the world around you
- Capacity to employ appropriate geo-scientific tools to solve problems and to interpret the results
- Understanding scientific methodology
- Competence in accessing, using and synthesising appropriate information
- Application of knowledge to solving problems and evaluating ideas and information
- Capacity to present ideas clearly with supporting evidence

Case studies

Due: **TBA**
Weighting: **45%**

Case studies (includes Hartley quiz + field notes 5%; Mt. Todd, 15%; Volcanoes, 10%, Hartley 15%)

On successful completion you will be able to:

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Competence in applying geo-scientific principles to understanding the world around you
- Capacity to employ appropriate geo-scientific tools to solve problems and to interpret the results
- Understanding scientific methodology
- Competence in accessing, using and synthesising appropriate information
- Application of knowledge to solving problems and evaluating ideas and information
- Capacity to present ideas clearly with supporting evidence

Final examination

Due: **University Examination Period**
Weighting: **45%**

On successful completion you will be able to:

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Competence in applying geo-scientific principles to understanding the world around you
- Capacity to employ appropriate geo-scientific tools to solve problems and to interpret the results
- Understanding scientific methodology
- Competence in accessing, using and synthesising appropriate information
- Application of knowledge to solving problems and evaluating ideas and information
- Capacity to present ideas clearly with supporting evidence

Delivery and Resources

Classes

IMPORTANT INFORMATION FOR EXTERNAL STUDENTS

Field trip and on-campus sessions

- The Hartley field trip for external students is on Saturday 8th October. There will be a bus leaving from MQ campus.

- The first on-campus session is on Saturday 3rd and Sunday 4th September.

- The second on-campus session is on Sunday 9th October.

Required and Recommended Texts and/or Materials

TEXTS AND REFERENCES

Unit booklet

This contains diagrams that will be referred to in lectures and the laboratory exercises. It is available through the University Co-Operative Bookshop. The completed worksheets are invaluable as an aid during revision for the examination. The booklet is essential for the laboratory exercises, but it is not intended to serve as a formal guide to the lectures. You will have to take your own explanatory notes and complement them with extra reading.

Textbook (available in the Bookshop)

The recommended text is:

Tarbuck, E. J., Lutgens, F. K. and Tasa, D. (2010). Earth: An introduction to Physical Geology (10th ed.). Pearson - Prentice Hall, New Jersey.

This gives more background information, often written from a different perspective from the lectures. It also contains photographs and diagrams for use in the lectures and laboratory exercises. In the library you may find several other basic textbooks on Physical Geology that will be of use to you.

Reading List

You may find the following books helpful for reference. They should provide useful supportive material to the lectures, case studies and laboratory exercises, and supplement the prescribed textbook and the Unit of Study booklet.

Earth Dynamics, Materials and the Environment is a subject relying heavily on observation, so it will be of great help to look at a variety of illustrations of the features that are covered in the unit of study. The books listed below are generally well illustrated, with striking colour photographs and diagrams.

** indicates a book in Special Reserve in the Library; * indicates a book on 3-day loan.

**Branagan, D.F. and Packham, G.H., 2000. Field geology of NSW. NSW Dept of Mineral Resources. Sydney. QE45.B7

*Busch, R.M., Tarbuck, E.J. and Lutgens, F.K, 1993. A study guide to accompany "The earth — an introduction to physical geology". Merrill. QE28.2.T37

*Cattermole, P., 2000. Building Planet Earth. Cambridge University Press. QE26.2.C384

*Hamblin, W.K. 1998. Earth's Dynamic Systems. Macmillan (8th Ed.) QE28.2.H35

*Hamblin, W.K. and Howard, J.D. 1995. Exercises in Physical Geology. QE28.2.H36

**Herbert, C. and Helby, R., 1980. A Guide to the Sydney Basin. Geological Survey of NSW Bulletin 26. QE341.N4

**Kimberley, M.M and Kimberley, S.J. 1995. Study guide to Skinner/Porter's The Dynamic Earth: an introduction to physical geology. Third Edition. Wiley (3rd Ed) QE28.2K56

*Merritts, D.J., De Wet, A., and Menking, K., 1998. Environmental Geology: an earth system science approach. Freeman, New York. QE38.M47

*Monroe, J.S. and Wicander, R. 1992 Physical Geology — exploring the earth. Harper Educational Publ.; West Publ. Co St. Paul. QE28.2.M655

*Montgomery, C.W., 1993. Physical Geology. Wm C. Brown (3rd Ed.) QE28.2.M66

*Morrison, R., 1988. Voyage of the Great Southern Ark. Ure Smith Press. QE340.M67

*Morton, R.D., 1995. Student's Companion to Skinner and Porter's The Dynamic Earth; an introduction to Physical Geology, Third Edition. Wiley QE28.2.S552

*Murck, B.W., Skinner, B.J. and Porter, S.C., 1996. Environmental Geology. Wiley and Sons, New York. QE38.M87/1996

*Plummer, C.C. and McGeary, D., 1999. Physical Geology. Wm C. Brown Publ., Iowa (8th Ed.). QE28.2.P58

*Press, F. and Siever, R. 1998. Understanding Earth. Freeman, New York (2nd Ed.) (replaces Earth, 4th Ed.). QE28.P9

**Scheibner, E., 1999. The geological evolution of New South Wales. Dept of Mineral Resources. QE341.S296

**Skinner, B.J. and Porter, S.C., 2000. The Dynamic Earth: an introduction to physical geology. Wiley , 4th Ed. QE28.2.S55

**Skinner, B.J., Porter, S.C. and Botkin, D.B., 1999. The Blue Planet. Wiley , 2nd Ed. QB631.S57

*Smith, D.G., 1981. The Cambridge Encyclopedia of Earth Sciences Cambridge Univ. Press, Cambridge. QE26.2.C35

*Stanley, S.M., 1989. Earth and life through time. W.H. Freeman and Company, N.Y. QE28.3.S73

*Tarbuck, E.J. and Lutgens, F.K., 1999. The earth — an introduction to physical geology. Merrill (6th Ed.). QE28.2.T37

**Van Andel, T.H., 1994. New views of an old planet: continental drift and the history of the earth. Cambridge Univ. Press, Cambridge (2nd Ed.). QE26.2.V36

*Veevers, J.J., 2000. Billion-year earth history of Australia and neighbours in Gondwanaland. GEMOC Press, Sydney. QE340.B55

CD-ROMS

**Dunning, J and Onesti, L.J., 1998. Earth Matters. Freeman and Co., New York. QE38.D8

**Tasa, D., 1999. Illustrated dictionary of earth science. Tasa Graphic Arts. QE5.I45

Library Loans

The Library at Macquarie will have provided you with information on library loans. The procedures differ for metropolitan and country students. Please familiarise yourself with the procedures appropriate in your case. If you have any enquiries contact the Library on (02) 9850-7500.

Technology Used and Required

Described in the Unit page at http://ilearn.mq.edu.au

Unit Schedule

Week	Lecture	Lectures available on-line (iLearn/iLecture)	Laboratory	
1	Introduction – Meet Planet Earth (1E - 1VES) [JCA]	Geoscience Tools (1 E ; 1 VES) [RF]	Practical 1: Introduction to Maps	Mt Todd Case Study
2	Plate Tectonics: The Unifying Theme (2E - 7 VES) [JCA]	Geology of the Landscape (6,15E - 4 VES) [RF]	Practical 2: Campus Excursion	Mt Todd Case Study
3	Atoms, Elements, Minerals, Rocks (3E -2, 3 VES [JCA]	New Minerals from Old (6E - 4 VES) [KD]	Practical 3: Geological Maps	Mt Todd Case Study
4	Plate Tectonics and Igneous Rocks (4, 13,14 E - 9 VES) [JCA]	Sediments to Rocks (7E - 4 VES) [KD]	Practical 4: Minerals and Mineral Properties	Mt Todd Case Study
5	Volcanoes and Volcanic Hazards (5E - 9 VES) [HH]	Exploration Technology [ML]	Practical 5: Volcanic (Extrusive) Rocks	Volcanoes Case Study
6	Plutons and Intrusive Activity (4,14E - 9 VES) [HH]	Dating the Earth with Zircon [EB]	Practical 6: Plutonic (Intrusive) Rocks	Volcanoes Case Study
7	Metamorphism and Metamorphic Rocks (8E - 3 VES) [ND]	Oceans (12 VES) [KD]	Practical 7: Metamorphic Minerals and Rocks	Volcanoes Case Study
8	Public Holiday	Rivers (14) [KD]		Volcanoes Case Study
9	Changing Rocks and Crustal Deformation (8,10E - 3 VES) [ND]	Groundwater (5 VES) [KD]	Practical 8: Minerals of Economic Significance	Hartley Case Study
10	Earthquakes and Earthquake Hazards (11E - 8 VES) [JCA]	Sydney Basin and Beyond [RF]	Practical 9: Earthquakes and Seismology	Hartley Case Study

11	Earth's Interior (11,12E - 8 VES) [JCA]	Exploration Technology [ML]	Practical 10: Exam Revision - Maps	Hartley Case Study
12	Geochemical Tools and Dating the Earth (9E - 10 VES) [TR]	Fossils and time (10 VES) [SG]	Practical 11: Exam Revision - Rocks	Hartley Case Study
13	Hydrocarbons and other fuels (23E) [SG]		Hartley Case Study Quiz and Exam Revision	

- Numbers in brackets represent chapters from Earth: An introduction to Physical Geology (E) and Visualizing Earth Science (VES), which should be reviewed at approximately two per week.

- Initials in square brackets are the names of the lecturers: JCA = Juan Carlos Afonso; TR = Tracy Rushmer; ND = Nathan Daczko, SG = Simon George; ML = Mark Lackie; KD = Kelsie Dadd; RF = Richard Flood; HH = Heather Handley; TF = Tim Flannery; EB = Elena Belussova

* These are complementary Power Point presentations that students need to review every week.

Learning and Teaching Activities

Lectures

Review of fundamental concepts associated with specific topics. Conceptual background for practicals.

Practicals

Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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://www.mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://www.mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://www.mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://www.mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Special Consideration Policy http://www.mq.edu.au/policy/docs/special_consideration/policy.html

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Support

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at: http://students.mq.edu.au/support/

UniWISE provides:

- Online learning resources and academic skills workshops http://www.students.mq.edu.au/support/learning_skills/
- Personal assistance with your learning & study related questions.
- The Learning Help Desk is located in the Library foyer (level 2).
- Online and on-campus orientation events run by Mentors@Macquarie.

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

Details of these services can be accessed at http://www.student.mq.edu.au/ses/.

IT Help

If you wish to receive IT help, we would be glad to assist you at 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 and it outlines what can be done.

Graduate Capabilities

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 outcome

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress

Assessment tasks

- Case studies

- Final examination

Learning and teaching activities

- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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 outcome

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress

Assessment task

- Weekly quiz

Learning and teaching activity

- Review of fundamental concepts associated with specific topics. Conceptual background for practicals.
- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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 tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Understanding scientific methodology

Assessment tasks

- Case studies
- Final examination

Learning and teaching activities

- Review of fundamental concepts associated with specific topics. Conceptual background for practicals.
- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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 outcome

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress

Assessment tasks

- Case studies
- Final examination

Learning and teaching activities

- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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 tools and methods that are used in the geosciences; these are

organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress

- Understanding scientific methodology

Assessment tasks

- Case studies
- Final examination

Learning and teaching activities

- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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 outcome

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress

Assessment task

- Case studies

Learning and teaching activity

- Review of fundamental concepts associated with specific topics. Conceptual background for practicals.
- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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 tools and methods that are used in the geosciences; these are

organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Understanding scientific methodology

Assessment tasks

- Case studies
- Final examination

Learning and teaching activities

- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Understanding scientific methodology

Assessment task

- Case studies

Learning and teaching activity

- Review of fundamental concepts associated with specific topics. Conceptual background for practicals.
- Hands-on activities associated with important and practical concepts/tools used in different Earth Science disciplines

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

- Understanding of the tools and methods that are used in the geosciences; these are organised in three modules: o Tools of the geoscientist o Hot rocks o Rocks under stress
- Understanding scientific methodology

Assessment task

- Case studies

Learning and teaching activity

- Review of fundamental concepts associated with specific topics. Conceptual background for practicals.

Changes since First Published

Date	Description
11/02/2013	The Description was updated.