Unit Outline

GEOP5000 Applied Geophysics
Semester 1, 2015

Unit study package code: GEOP5000
Mode of study: Fully Online
Tuition pattern summary: This unit does not have a fieldwork component.
Credit Value: 25.0

Pre-requisite units:
- 308919 (v.1) WASM Geological Concepts 511
  OR
- 308919 (v.2) Geological Concepts 511
  OR
- GEOL5003 (v.0) Geological Concepts or any previous version
  AND
- 308920 (v.0) Resource Geology 511 or any previous version
  OR
- 314959 (v.0) Field Geology and Maps 591 or any previous version
  OR
- GEOL5005 (v.0) Field Geology and Maps or any previous version

Co-requisite units: Nil
Anti-requisite units: Nil
Result type: Grade/Mark
Approved incidental fees: Information about approved incidental fees can be obtained from our website. Visit fees.curtin.edu.au/incidental_fees.cfm for details.

Unit coordinator:
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Building: 613
Room: 4D04
Consultation times: By prior appointment

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Learning Management System:  Blackboard  (lms.curtin.edu.au)
Acknowledgement of Country
We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present.

Syllabus
Geophysics is used to investigate the physical properties of the ground directly beneath the earth’s surface. Techniques to be covered include gravity, magnetic, electromagnetic, electrical, radiometric and seismic surveys. Each of these methods provides unique information regarding subsurface geology and the potential for mineral deposits as well as having limitations. Online delivery.

Introduction
Welcome to the Applied Geophysics unit.
This unit provides an introduction to geophysics, which is the main technique used to investigate the physical nature of the ground directly beneath the Earth’s surface and consequently is a valuable tool for the non-invasive exploration of the Earth’s sub-surface. Study topics cover the geophysical techniques applicable to mineral exploration and tutorials provide exercises on typical geophysics data analysis and interpretation.

Unit Learning Outcomes
All graduates of Curtin University achieve a set of nine graduate attributes during their course of study. These tell an employer that, through your studies, you have acquired discipline knowledge and a range of other skills and attributes which employers say would be useful in a professional setting. Each unit in your course addresses the graduate attributes through a clearly identified set of learning outcomes. They form a vital part in the process referred to as assurance of learning. The learning outcomes tell you what you are expected to know, understand or be able to do in order to be successful in this unit. Each assessment for this unit is carefully designed to test your achievement of one or more of the unit learning outcomes. On successfully completing all of the assessments you will have achieved all of these learning outcomes.

Your course has been designed so that on graduating we can say you will have achieved all of Curtin’s Graduate Attributes through the assurance of learning process in each unit.

<table>
<thead>
<tr>
<th>On successful completion of this unit students can:</th>
<th>Graduate Attributes addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain and compare the use and limitation of gravity, magnetic, radiometric, seismic, electrical, electromagnetic, and borehole methods used in geophysical mineral exploration</td>
<td>Thinking skills (use analytical skills to solve problems)</td>
</tr>
<tr>
<td>2. Describe and apply geophysical data processing, databases, filters and image techniques used in geophysical mineral exploration</td>
<td>Information skills (confidence to investigate new ideas)</td>
</tr>
<tr>
<td>3. Analyse and interpret simple datasets from gravity, magnetic, radiometric, seismic, electrical and electromagnetic geophysical exploration methods</td>
<td>Learning how to learn (apply principles learnt to new situations) (confidence to tackle unfamiliar problems)</td>
</tr>
</tbody>
</table>

Curtin’s Graduate Attributes

<table>
<thead>
<tr>
<th>Apply discipline knowledge</th>
<th>Thinking skills (use analytical skills to solve problems)</th>
<th>Information skills (confidence to investigate new ideas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>Technology skills</td>
<td>Learning how to learn (apply principles learnt to new situations) (confidence to tackle unfamiliar problems)</td>
</tr>
<tr>
<td>International perspective</td>
<td>Cultural understanding (value the perspectives of others)</td>
<td>Professional Skills (work independently and as a team) (plan own work)</td>
</tr>
<tr>
<td>(value the perspectives of others)</td>
<td></td>
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</tbody>
</table>

Find out more about Curtin’s Graduate attributes at the Office of Teaching & Learning website: ctl.curtin.edu.au

Learning Activities
Weekly topics cover theory and application aspects of the different geophysical methods applicable to mineral exploration. Tutorials on the relevant topic are provided for students to work through and complete each week. Completion of these tutorials is necessary for completion of the assignments.

The topic and tutorial schedule is provided at the end of this unit outline.

It is expected that a student would need to complete 11 hours of combined study/tutorial/assignment time per week.
Learning Resources

Essential texts
The required textbook(s) for this unit are:


Recommended texts
You do not have to purchase the following textbooks but you may like to refer to them.


Other resources
Additional study and reference material will be made available via Blackboard and the Library e-Reserve system.

The geophysical processing and analysis software that is required for tutorials and assignments will be made available to students during the semester via remote login to a virtual machine hosted on a University server. Access details will be provided in the tutorial information at the start of the semester.
Assessment

Assessment schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Value %</th>
<th>Date Due</th>
<th>Unit Learning Outcome(s) Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written assignment 1</td>
<td>30 percent</td>
<td>Week: 4</td>
<td>1,2,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Day: Wednesday</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time: 5pm (AWST)</td>
<td></td>
</tr>
<tr>
<td>eTest 1</td>
<td>20 percent</td>
<td>Week: 9</td>
<td>2,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Day: Wednesday</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time: 5pm (AWST)</td>
<td></td>
</tr>
<tr>
<td>Written assignment 2</td>
<td>30 percent</td>
<td>Week: 12</td>
<td>1,2,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Day: Wednesday</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time: 5pm (AWST)</td>
<td></td>
</tr>
<tr>
<td>eTest 2</td>
<td>20 percent</td>
<td>Week: 15</td>
<td>1,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Day: Wednesday</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time: 5pm (AWST)</td>
<td></td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

1. Written Assignments require students to:
   - explain geophysical concepts and principles;
   - identify and calculate typical geophysical gravity and magnetic properties and parameters;
   - discuss and compare the use and design of geophysical magnetic and gravity exploration methods;
   - apply and describe geophysical data processing and presentation techniques; and
   - analyse and interpret geophysical data that are provided or have previously been processed as tutorial activities.

A worksheet of assessment tasks and questions will be provided to students for which responses are to be given in specified document format and submitted via Blackboard. The assessment worksheet will also indicate marks to be awarded for complete and correct answers.

Assessment tasks are focussed on a range of geophysical topics and/or methods that have been covered in the preceding study weeks.

Assessment tasks assume that tutorial activities for the preceding weeks have been completed.

2. eTests require students to:
   - identify and apply geophysical concepts and principles with respect to presented scenarios;
   - select appropriate geophysical exploration methods and design parameters with respect to presented scenarios;
   - identify appropriate geophysical data processing techniques for specified outcome; and
   - identify and select valid interpretation of processed geophysical data.

Assessment tasks are focussed on a range of geophysical topics and/or methods that have been covered in the preceding study weeks.

Assessment tasks assume that tutorial activities for preceding weeks have been completed.

The assessment is conducted as an online test through Blackboard with the following time and completion constraints:
   - the test will be available in Blackboard for two days prior to the completion deadline;
   - once the test has been commenced it must be completed within 2 hours; and
   - students will only be permitted one attempt at completing the test.

3. As described in 1 above but covering a different range of topics.

4. As described in 2 above but covering a different range of topics.

Pass requirements

Submission of ALL assessments (i.e. assignments and tests) is COMPULSORY.

Non-compliance will result in failure.

An overall mark of 50% is required to pass the unit.
Fair assessment through moderation

Moderation describes a quality assurance process to ensure that assessments are appropriate to the learning outcomes, and that student work is evaluated consistently by assessors. Minimum standards for the moderation of assessment are described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/policies/teachingandlearning.cfm

Late assessment policy

This ensures that the requirements for submission of assignments and other work to be assessed are fair, transparent, equitable, and that penalties are consistently applied.

1. All assessments students are required to submit will have a due date and time specified on this Unit Outline.
2. Students will be penalised by a deduction of ten percent per calendar day for a late assessment submission (eg a mark equivalent to 10% of the total allocated for the assessment will be deducted from the marked value for every day that the assessment is late). This means that an assessment worth 20 marks will have two marks deducted per calendar day late. Hence if it was handed in three calendar days late and given a mark of 16/20, the student would receive 10/20. An assessment more than seven calendar days overdue will not be marked and will receive a mark of 0.

Assessment extension

A student unable to complete an assessment task by/on the original published date/time (eg examinations, tests) or due date/time (eg assignments) must apply for an assessment extension using the Assessment Extension form (available from the Forms page at students.curtin.edu.au/administration/) as prescribed by the Academic Registrar. It is the responsibility of the student to demonstrate and provide evidence for exceptional circumstances beyond the student’s control that prevent them from completing/submitting the assessment task.

The student will be expected to lodge the form and supporting documentation with the unit coordinator before the assessment date/time or due date/time. An application may be accepted up to five working days after the date or due date of the assessment task where the student is able to provide an acceptable explanation as to why he or she was not able to submit the application prior to the assessment date. An application for an assessment extension will not be accepted after the date of the Board of Examiners’ meeting.

Deferred assessments

If your results show that you have been granted a deferred assessment you should immediately check your OASIS email for details. Deferred examinations/tests will be held from 16/07/2015 to 17/07/2015. Notification to students will be made after the Board of Examiners’ meeting via the Official Communications Channel (OCC) in OASIS.

Supplementary assessments

Supplementary assessments, if granted by the Board of Examiners, will have a due date or be held between 16/07/2015 and 17/07/2015. Notification to students will be made after the Board of Examiners’ meeting via the Official Communications Channel (OCC) in OASIS.

It is the responsibility of students to be available to complete the requirements of a supplementary assessment. If your results show that you have been granted a supplementary assessment you should immediately check your OASIS email for details.

Referencing style

The referencing style for this unit is Society of Exploration Geophysicists (SEG). More information on this referencing style can be obtained at http://www.seg.org/resources/publications/books/bookinstructionstoauthors

Academic Integrity (including plagiarism and cheating)

Any conduct by a student that is dishonest or unfair in connection with any academic work is considered to be academic misconduct. Plagiarism and cheating are serious offences that will be investigated and may result in penalties such as reduced or zero grades, annulled units or even termination from the course.

Plagiarism occurs when work or property of another person is presented as one’s own, without appropriate acknowledgement or referencing. Submitting work which has been produced by someone else (e.g. allowing or contracting another person to do the work for which you claim authorship) is also plagiarism. Submitted work is subjected to a plagiarism detection process, which may include the use of text matching systems or interviews with students to determine authorship.

Cheating includes (but is not limited to) asking or paying someone to complete an assessment task for you or any use of unauthorised materials or assistance during an examination or test.

For more information, including student guidelines for avoiding plagiarism, refer to the Academic Integrity tab in Blackboard or
Additional information

Submission of assignments:
Assignments must be the student’s own independent work, not group work: if any work or information (e.g. from textbooks, the Internet, published papers, other students, lecture slides etc) is used that is not the student’s original work then it must be properly acknowledged and referenced. Students must also read the plagiarism sections elsewhere in this unit outline and adhere to the university policy on plagiarism and academic misconduct.

Assignment worksheets and associated documents will be available for download from the Assessment area in Blackboard.

Submission of all student assignments must be via Blackboard.
Instructions will be given during the semester as to the required format of the written assignment submission and how to minimise uploading problems, the submission format will usually be a PDF unless otherwise stated. In addition, students should read the information on submitting assignments and reducing file sizes that is provided under the ‘Student’ tab on their Blackboard site.
Marked written assignments will be returned to students, as a PDF document, together with marks and feedback via their 'My Grades' area in Blackboard.
Students should allow a 2 to 3 week marking turnaround for written assignments.
Penalties apply for the late submission of assessments (i.e. assignments) unless prior arrangements have been made and agreed to by the unit coordinator. Students should familiarise themselves with the late assessment policy, late submission penalties and assessment extension sections elsewhere in this unit outline.

Geophysical processing software:
Specialist geophysical processing software is used for some of the tutorial and assignment work during the semester. Student access to this software is achieved by remote login to virtual machines (VMs) hosted on a University server. This necessitates the need for students to have appropriate Internet access at some stages of the tutorial and assignment completion process. Login details will be provided in the tutorial information at the start of the semester.

Computer requirements:
The nature of the computer-based tutorial and assessment tasks necessitates that students have access to a reliable, recent model of computer (i.e. less than three years old) and good quality, reliable network connection.

Virtual collaboration sessions:
In order to provide students with the opportunity to participate in interactive joint sessions with other students and the lecturer, a few virtual collaboration sessions will be held during the semester. It is intended that these sessions will function as "virtual computer labs" whereby students can obtain assistance with learning how to use the geophysical software associated with the tutorial and assignment tasks.
These sessions are voluntary and are intended to provide additional assistance and engagement for students but are in no way required for students to successfully complete the tutorial and assignment tasks. The sessions will be scheduled at times that endeavour to be the most convenient to the majority of students.
To participate interactively, students will need to have suitable webcam, microphone and headphones (similar requirements to those needed for Skype).
More information about these sessions will be provided during the semester.

Email Contact with the Unit Coordinator and your Lecturer:
Students are welcome to contact the unit coordinator and their lecturer via email. However, before sending an email, please make sure that the information you are seeking has not already been provided in the Unit Outline, on Blackboard or via email. Please note that the unit coordinator, lecturers and administrative staff will use a student’s Curtin email address to send emails. It is the students’ responsibility to regularly check their Curtin email and the Official Communications Channel (OCC) in OASIS for official correspondence.
Students are required to use their official Curtin email address for emails sent to Curtin staff. When sending an email please observe proper email etiquette. Appropriate and courteous language must be used at all times. Please do not use abbreviations or
SMS style messaging when writing an email. Always provide your full name and student number when you send an email to Curtin staff.

Enrolment
It is your responsibility to ensure that your enrolment is correct - you can check your enrolment through the eStudent option on OASIS, where you can also print an Enrolment Advice.

Student Rights and Responsibilities
It is the responsibility of every student to be aware of all relevant legislation, policies and procedures relating to their rights and responsibilities as a student. These include:

- the Student Charter
- the University's Guiding Ethical Principles
- the University's policy and statements on plagiarism and academic integrity
- copyright principles and responsibilities
- the University's policies on appropriate use of software and computer facilities

Information on all these things is available through the University's "Student Rights and Responsibilities website at: students.curtin.edu.au/rights.

Student Equity
There are a number of factors that might disadvantage some students from participating in their studies or assessments to the best of their ability, under standard conditions. These factors may include a disability or medical condition (e.g. mental illness, chronic illness, physical or sensory disability, learning disability), significant family responsibilities, pregnancy, religious practices, living in a remote location or another reason. If you believe you may be unfairly disadvantaged on these or other grounds please contact Student Equity at eesj@curtin.edu.au or go to http://eesj.curtin.edu.au/student_equity/index.cfm for more information.

You can also contact Counselling and Disability services: http://www.disability.curtin.edu.au or the Multi-faith services: http://life.curtin.edu.au/health-and-wellbeing/about_multifaith_services.htm for further information.

It is important to note that the staff of the university may not be able to meet your needs if they are not informed of your individual circumstances so please get in touch with the appropriate service if you require assistance. For general wellbeing concerns or advice please contact Curtin's Student Wellbeing Advisory Service at: http://life.curtin.edu.au/health-and-wellbeing/student_wellbeing_service.htm

Recent unit changes
We welcome feedback as one way to keep improving this unit. Students are encouraged to provide unit feedback through eVALUate, Curtin's online student feedback system (see evaluate.curtin.edu.au/info).

To view previous student feedback about this unit, search for the Unit Summary Report at evaluate.curtin.edu.au/student/unit_search.cfm. See evaluate.curtin.edu.au to find out when you can eVALUate this unit.

Recent changes to this unit include:

The format of some study materials has been changed in response to student eVALUate comments.

Also in response to other eVALUate comments, it is intended to run some "virtual computer lab" sessions at appropriate times during the semester in order to offer additional assistance to students during the times of learning how to use the geophysical software.

In response to student feedback, permission has been obtained to replace the end-of-semester examination with two eTest assessments that will be run at scheduled times during the semester. Further details are provided under the Assessment Task section of this unit outline.
# Program calendar

<table>
<thead>
<tr>
<th>Week</th>
<th>Begin Date</th>
<th>Topic</th>
<th>Pre-readings</th>
<th>Tutorial</th>
<th>Assessment Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>23 February</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>2 March</td>
<td>Introduction to geophysics and geophysical methods</td>
<td>Mussett &amp; Khan: Chapters 1, 2, 3, 19 &amp; 23</td>
<td>Geophysical properties and Oasis montaj tutorial</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>9 March</td>
<td>Gravity</td>
<td>Mussett &amp; Khan: Chapter 8</td>
<td>Gravity</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>16 March</td>
<td>Magnetics</td>
<td>Mussett &amp; Khan: Chapters 10 &amp; 11</td>
<td>Magnetics</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>23 March</td>
<td>Geophysical data processing and presentation</td>
<td>Mussett &amp; Khan: Chapters 2, 3, 8 &amp; 11</td>
<td>Geophysical data processing and presentation</td>
<td>Written Assignment 1 Wednesday 25 March</td>
</tr>
<tr>
<td>5.</td>
<td>30 March</td>
<td>Radiometrics</td>
<td>Mussett &amp; Khan: Chapter 16</td>
<td>Radiometrics</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>6 April</td>
<td>Seismic waves &amp; seismic refraction method</td>
<td>Mussett &amp; Khan: Chapters 4 &amp; 6</td>
<td>Seismic refraction</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>13 April</td>
<td>Self review of Topics 1 to 6</td>
<td></td>
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<tr>
<td>8.</td>
<td>20 April</td>
<td>Seismic reflection method</td>
<td>Mussett &amp; Khan: Chapters 4 &amp; 7</td>
<td>Seismic reflection</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>27 April</td>
<td>Electrical properties of rocks</td>
<td>Mussett &amp; Khan: Chapters 12 &amp; 13</td>
<td>Electrical properties</td>
<td>eTest 1 Wednesday 29 April</td>
</tr>
<tr>
<td>10.</td>
<td>4 May</td>
<td>Electrical and resistivity methods</td>
<td>Mussett &amp; Khan: Chapters 12 &amp; 13</td>
<td>Electrical methods</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>11 May</td>
<td>Electromagnetics and electromagnetic methods: FDEM and TEM</td>
<td>Mussett &amp; Khan: Chapter 14</td>
<td>Electromagnetics (TEM decay curves)</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>18 May</td>
<td>Electromagnetic methods: MT and VLF</td>
<td>Mussett &amp; Khan: Chapter 14</td>
<td>Electromagnetics (TEM maps)</td>
<td>Written Assignment 2 Wednesday</td>
</tr>
<tr>
<td></td>
<td>Date</td>
<td>Topic</td>
<td>Reference</td>
<td>Notes</td>
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<tr>
<td>13.</td>
<td>25 May</td>
<td>Electromagnetic methods: GPR</td>
<td>Mussett &amp; Khan: Chapter 14</td>
<td>Electromagnetics (GPR)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1 June</td>
<td>Borehole geophysics</td>
<td>Mussett &amp; Khan: Chapter 18</td>
<td>Borehole geophysics</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>8 June</td>
<td>Study &amp; Revision Week</td>
<td></td>
<td>eTest 2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>15 June</td>
<td>Examinations</td>
<td></td>
<td>Wednesday 10 June</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>22 June</td>
<td>Examinations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>