Unit Outline

312260 Introduction to Geophysical Mineral Exploration Methods 243
Semester 2, 2014

Unit study package number: 312260
Mode of study: Internal
Tuition pattern summary:
Lecture: 1 x 2 Hours
Computer Laboratory: 1 x 2 Hours
This unit contains a fieldwork component. Find out more at the fieldwork education website: (fieldworkeducation.curtin.edu.au)
Credit Value: 25.0
Pre-requisite units:
7032 (v.0) Geology 102 or any previous version
OR
193804 (v.0) Master of Science (Geology) or any previous version
AND
7031 (v.0) Geology 101 or any previous version
OR
11310 (v.0) Geology 111 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:
Title: Dr
Name: Andrew Squelch
Phone: 6436 8725
Email: A.Squelch@curtin.edu.au
Building: 613
Room: 4D04
Consultation times: By prior appointment
Teaching Staff:
Name: Andrew Squelch
Phone: 6436 8725
Email: A.Squelch@curtin.edu.au
Building: 613
Room: 4D04
Administrative contact:
Name: Deirdre Hollingsworth
Phone: +618 9266 3565
Email: D.Hollingsworth@curtin.edu.au
Building: 613
Room: 4H02
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

Introduction to geophysical methods. Magnetics theory, acquisition and interpretation. Transient electromagnetic methods; Electrical properties of rocks; magnetotellurics. Gravity theory, acquisition and interpretation. Radio detection and ranging; induced polarisation; radiometrics; borehole methods. Collecting and displaying geophysical data. Field exercises.

Introduction

Welcome to Introduction to Geophysical Mineral Exploration Methods 243.

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. The unit is designed to provide the student with a basic knowledge of the geophysical methods that are applicable to mineral exploration. Study topics include: magnetics, gravity, radiometrics, electrical, electromagnetics and ground penetrating radar. Laboratory classes complement the theory classes to provide practical aspect to the student's learning outcomes.

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 the use of magnetic electrical radiometric gravity and borehole methods used in geophysical exploration</td>
<td><img src="ctl.curtin.edu.au" alt="Graduate Attributes" /></td>
</tr>
<tr>
<td>2 Demonstrate proficiency in geophysical data processing databases filters and image techniques used in geophysical exploration</td>
<td><img src="ctl.curtin.edu.au" alt="Graduate Attributes" /></td>
</tr>
<tr>
<td>3 Perform basic magnetic and Vertical Electrical Sounding surveys</td>
<td><img src="ctl.curtin.edu.au" alt="Graduate Attributes" /></td>
</tr>
<tr>
<td>4 Use electromagnetic and radiometric methods of exploration to collect and analyse data</td>
<td><img src="ctl.curtin.edu.au" alt="Graduate Attributes" /></td>
</tr>
</tbody>
</table>

Curtin's Graduate Attributes

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

Find out more about Curtin's Graduate attributes at the Office of Teaching & Learning website: [ctl.curtin.edu.au](http://ctl.curtin.edu.au)
Learning Activities

Lectures explain theory and practical aspects of the different geophysical methods applicable to mineral exploration. The laboratory classes are designed to complement the lectures and provide an additional way to learn some of the course material. Lectures and labs are timetabled so that lab sessions are preceded by the relevant theory and instruction.

The lecture and laboratory schedule is provided at the end of this unit outline.

In addition to the 2 hours of lecture and the 2 hours of laboratory per week, it is expected that a student would need to complete an additional 6 hours of associated study/work 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

Apart from the specified text books, some teaching material will be made available online through Blackboard (e.g. lecture slides) and/or eReserve (e.g. articles). Further details will be provided during the lectures.

Access to necessary software will be provided in laboratory classes.
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>1 Magnetic and Radiometric exercise</td>
<td>25 percent</td>
<td>Week: Week 6 Day: On day of lab class Time: 20:00</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>2 Electromagnetic and VES exercise</td>
<td>25 percent</td>
<td>Week: Week 12 Day: On day of lab class Time: 20:00</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>3 End of semester exam</td>
<td>50 percent</td>
<td>Week: Examination period Day: TBA Time: TBA</td>
<td>1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

1. The assignment task consists of answering questions about magnetic and radiometric surveying theory, data acquisition and data processing. Plus the inclusion and interpretation of the magnetic and radiometric anomaly maps generated in the practical labs. The quality and accuracy of the submitted anomaly maps will also be assessed.

   Exact assignment submission day will depend on day of lab class that student attends.

2. The assignment task consists of answering questions about ground penetrating radar (GPR) and vertical electrical sounding (VES) surveying theory, data acquisition and data processing. Plus the inclusion and interpretation of data collected and processed in the practical labs, including a comparison of the associated geological sections. The quality and accuracy of the submitted processed data and plots will also be assessed.

   Exact assignment submission day will depend on day of lab class that student attends.

3. The end of semester examination will be a 2 hour closed book exam consisting of a combination of 20 multiple choice questions and three longer multi-part questions that require written answers. More details will be provided later in the semester.

   The final examination will be held during the formal examination period. It is the student’s responsibility to check the date, time and venue of the final examination via the OASIS-Student Portal.

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 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 which students are required to submit will have a due date and time specified on the Unit Outline.
2. Accepting late submission of assignments or other work will be determined by the unit coordinator or Head of School and will be specified on the Unit Outline.
3. If late submission of assignments or other work is not accepted, students will receive a penalty of 100% after the due date and time ie a zero mark for the late assessment.
4. If late submission of assignments or other work is accepted, students will be penalised by 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 assignment worth 20 will have two marks deducted per calendar day late. Hence if it was handed in three calendar days late and marked as 12/20, the student would receive 6/20. An assessment more than seven calendar days overdue will not be marked. Work submitted after this time (due date plus seven days) may result in a Fail - Incomplete (F-IN) grade being awarded for the unit.
Assessment extension

A student wishing to delay the completion or submission of an assessment task after 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 http://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 prevented 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.

Additional assessment information

Pass requirements

Submission of ALL assessments (i.e. assignments and examination) is COMPULSORY. Non-compliance will result in failure.

An overall mark of 50% is required to pass the unit.

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

Plagiarism

Plagiarism occurs when work or property of another person is presented as one’s own, without appropriate acknowledgement or referencing. Plagiarism is a serious offence. Student guidelines for avoiding plagiarism can be found at: http://academicintegrity.curtin.edu.au/local/docs/StudentPlagiarismGuide.pdf. For more information refer to academicintegrity.curtin.edu.au.

Plagiarism monitoring

Work submitted may be subjected to a plagiarism detection process, which may include the use of systems such as ‘Turnitin’. For further information, see academicintegrity.curtin.edu.au/students/turnitin.cfm.
Additional information

Lab classes and field work

Many of the lab classes are held in the rooms of the Department of Exploration Geophysics in the CSIRO ARRC Building (613) in Technology Park. Access to the ARRC Building requires that each student has their own access card, in addition to their student ID card. Full details of how to obtain an ARRC access card will be provided at the first lecture, these include the requirement that students pay a refundable deposit at Student Services on campus before obtaining their card.

While in the ARRC Building students must abide by the rules of the ARRC Building, which are detailed in the access card application forms. These rules strictly prohibit the wearing of open-top type of footwear, i.e. thongs or flip-flops, on the premises. In addition, the Department of Exploration Geophysics also prohibits food and drink in its computer labs.

Several of the lab classes involve outdoor field work (usually near the ARRC Building or on the Curtin Oval) and cold, wet or very hot weather can occur during these classes, consequently students are strongly advised to wear appropriate clothing and footwear for this type of work and the prevailing weather conditions.

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 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 assignment submission and how to minimise uploading problems. However, students should read the information on submitting assignments and reducing file sizes that is provided under the ‘Student’ tab on their Blackboard site.

The assignment submission format will usually be a PDF unless otherwise stated.

Marked 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.

Email Contact with the Unit Coordinator and your Lecturer(s)

Students are welcome to contact the unit coordinator and their lecturer(s) 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.

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.

Supplementary and Deferred Exams

Deferred examinations will be held at a date to be advised (see next section). Supplementary examinations, where applicable and when granted by the Board of Examiners, will be held at a date to be advised (see next section). 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 attend a supplementary or deferred examination on the date advised and to check their OASIS account on a weekly basis for official Curtin correspondence. If your results show that you have been granted a supplementary or deferred examination you should immediately check your OASIS email for details.
Supplementary/Deferred examinations will be held, if necessary, only on Thursday 18th and Friday 19th December 2014. Following the Board of Examiner's Meeting, held on Tuesday 9th December 2014, students who have been awarded a Supplementary Examination will be advised accordingly. Students can contact the Department on 9266-3565 for confirmation and further information about the arrangements.

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://unilife.curtin.edu.au/diversity_and_faith/faith_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/). Recent changes to this unit include:

See evaluate.curtin.edu.au to find out when you can eVALUate this unit.
<table>
<thead>
<tr>
<th>Week</th>
<th>Begin Date</th>
<th>Lecture</th>
<th>Pre-readings</th>
<th>Lab</th>
<th>Assessment Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>28 July</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>4 August</td>
<td>Introduction to geophysical exploration methods</td>
<td>Mussett &amp; Khan: Chapters 1, 2, 3, 8, 19 and 23</td>
<td></td>
<td>Rock properties</td>
</tr>
<tr>
<td>2.</td>
<td>11 August</td>
<td>Gravity and Magnetic methods</td>
<td>Mussett &amp; Khan: Chapters 8, 10 and 11</td>
<td></td>
<td>Magnetic field data acquisition</td>
</tr>
<tr>
<td>3.</td>
<td>18 August</td>
<td>Geophysical data presentation</td>
<td>Mussett &amp; Khan: Chapters 2, 3, 8 and 11</td>
<td></td>
<td>Magnetic data interpretation</td>
</tr>
<tr>
<td>4.</td>
<td>25 August</td>
<td>Radiometrics and radiometric surveying</td>
<td>Mussett &amp; Khan: Chapters 15 and 16</td>
<td></td>
<td>Radiometrics interpretation</td>
</tr>
<tr>
<td>5.</td>
<td>1 September</td>
<td>Tuition Free Week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>8 September</td>
<td>Electrical properties of rocks and resistivity methods</td>
<td>Mussett &amp; Khan: Chapter 12</td>
<td>VES data acquisition</td>
<td>Assignment 1 8pm, on day of lab</td>
</tr>
<tr>
<td>7.</td>
<td>15 September</td>
<td>Induced polarisation and resistivity methods continued</td>
<td>Mussett &amp; Khan: Chapter 13</td>
<td>VES interpretation</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>22 September</td>
<td>Electromagnetics and electromagnetic methods</td>
<td>Mussett &amp; Khan: Chapter 14</td>
<td>TEM interpretation</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>29 September</td>
<td>Tuition Free Week</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10.</td>
<td>6 October</td>
<td>Ground penetrating radar (GPR)</td>
<td>Mussett &amp; Khan: Chapter 14</td>
<td>GPR data acquisition</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>13 October</td>
<td>Magnetotellurics, CSAMT and VLF</td>
<td>Mussett &amp; Khan: Chapter 14</td>
<td>GPR interpretation</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>20 October</td>
<td>Borehole methods</td>
<td>Mussett &amp; Khan: Chapter 18</td>
<td>Borehole tools and log interpretation</td>
<td>Assignment 2 8pm, on day of lab</td>
</tr>
<tr>
<td>13.</td>
<td>27 October</td>
<td>Geophysical exploration surveying</td>
<td>Mussett &amp; Khan: All of above</td>
<td>Seismic refraction acquisition and interpretation</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>3 November</td>
<td>Revision</td>
<td>Mussett &amp; Khan: All of above</td>
<td>Revision</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>10 November</td>
<td>Study Week</td>
<td></td>
<td></td>
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<tr>
<td>16.</td>
<td>17 November</td>
<td>Examinations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>24 November</td>
<td>Examinations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>