Unit Outline
12458 Electromagnetics and Radiometrics for Exploration 302
Semester 2, 2014

Unit study package number: 12458
Mode of study: Internal
Tuition pattern summary: Lecture: 1 x 2 Hours
Computer Laboratory: 1 x 3 Hours
This unit does not have a fieldwork component.
Credit Value: 25.0
Pre-requisite units:
- 7032 (v.0) Geology 102 or any previous version
- 307728 (v.0) Electromagnetic Fields in the Earth 202 or any previous version
- 8128 (v.0) Linear Algebra 202 or any previous version
  OR
- 7905 (v.0) Mathematical Methods 202 or any previous version
  AND
- 8127 (v.0) Advanced Calculus 201 or any previous version
  OR
- 8648 (v.0) Mathematical Methods 201 or any previous version
  AND
- 314670 (v.0) Geophysics Major (Master of Science) 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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<table>
<thead>
<tr>
<th>Room:</th>
<th>613</th>
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<tbody>
<tr>
<td>Name:</td>
<td>Anton Kepick</td>
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<tr>
<td>Phone:</td>
<td>9266-7503</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:a.kepick@curtin.edu.au">a.kepick@curtin.edu.au</a></td>
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<td>Building:</td>
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<tr>
<td>Name:</td>
<td>Van Anh Cuong Le</td>
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<tr>
<td>Email:</td>
<td><a href="mailto:v.le3@postgrad.curtin.edu">v.le3@postgrad.curtin.edu</a></td>
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**Administrative contact:**

| Name: | Deirdre Hollingsworth |
| Phone: | 9266 3565 |
| Email: | d.hollingsworth@curtin.edu.au |
Acknowledgement of Country
We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present.

Syllabus
Electromagnetic (EM): Basic principles; description of frequency and time domain EM systems; magnetotellurics (MT) and CSAMT, system characteristics and response forms; field configurations, modelling and interpretation techniques; applications and geoelectrical considerations.

Introduction
Welcome to Electromagnetics & Radiometrics 302. This unit is designed to present the student with -

1. A comprehensive coverage of the electromagnetic and radiometric methods; and
2. examples of geophysical surveys in mining, groundwater, and engineering applications.

The following Electromagnetic methods will be covered:

1. Loop-loop system, frequency domain systems (FEM)
2. Time-domain EM (TDEM)
3. Magnetotellurics (MT)
4. Ground penetrating radar (GPR)

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>
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<tbody>
<tr>
<td>1. Explain the theory of EM coupling</td>
<td><img src="icon.png" alt="chat" /> <img src="icon.png" alt="email" /></td>
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<tr>
<td>2. Design and perform an exploration scale EM survey for a particular target</td>
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<tr>
<td>3. Perform data reduction, processing, and modelling of TEM data</td>
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<tr>
<td>4. Identify artefacts and common pitfalls in interpreting TEM/FEM/MT data</td>
<td><img src="icon.png" alt="lightbulb" /> <img src="icon.png" alt="people" /></td>
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Curtin’s Graduate Attributes

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

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

Learning Activities

Lectures to provide knowledge and insight into the use of various electromagnetic means to solve problems in the discovery and characterising of the earth.
Laboratory and field exercises to provide experience with tools to collect, understand, image, and interpret the EM response of the earth under various scenarios.
The lecture schedule is provided at the end of this unit outline.
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.

- You do not have to purchase the following textbooks but you may like to refer to them.
  - Plus the current literature and appropriate specialised monographs, as advised in lectures.

Online resources


( http://dx.doi.org/10.1190/1.9781560802686)

Other resources
Extra material to support lectures and laboratories, such as Matlab codes, spreadsheets and instructions/guidelines will be available on blackboard. Field equipment will be made available on the day of instruction, and software to process and display data is available in the ARRC computer labs 24/7 for students.
Faculty of Science and Engineering  
Department of Exploration Geophysics

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>
</table>
| Examination                       | 50 percent | Week: formal Examination Week  
Day: formal Examination Week  
Time: 2 hour theory | 1,3,4 |
| Laboratory work/field exercises   | 50 percent | Week: Every other teaching week  
Day: Wednesdays  
Time: 11 AM | 2,3,4 |

Detailed information on assessment tasks

1. Examination – 2 hour theory examination held during the formal Examination Weeks

2. Laboratory Work / Fieldwork exercises

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 i.e. 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 (e.g. 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 (e.g. examinations, tests) or due date/time (e.g. 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

Students must pass all assessments (Examination and laboratory work/Fieldwork)

Referencing style

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

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

All assignments must be accompanied by an Assignment Attachment Form (or cover page) where provided by the Lecturer. Alternatively, assignments need to clearly show the Student’s Name, Student ID number, the Title and Number of the Assignment, and the Name of the Lecturer on the first page of their assignment.
Unless otherwise advised by the lecturer/s, all assignments MUST be lodged into the respective Lecturers’ Locked Assignment Box, located at the Department of Exploration Geophysics Reception Desk.
All assignments must be received by 11 am on the Wednesday of the week due.

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:

A restructuring of Laboratory exercises so that there are no outstanding exercises by the end of semester.

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/Seminar</th>
<th>Pre-readings</th>
<th>Tutorial/Lab</th>
<th>Assessment Due</th>
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<tbody>
<tr>
<td>Orientation</td>
<td>30 July</td>
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<tr>
<td>1.</td>
<td>5 August</td>
<td>Fundamentals of EM for Targeting</td>
<td>Assignment 1: FEM modelling</td>
<td>Wednesday, week3</td>
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<td>2.</td>
<td>12 August</td>
<td>Fundamentals of EM for Targeting</td>
<td>Assignment 1: FEM modelling</td>
<td>Wednesday, week3</td>
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<td>3.</td>
<td>19 August</td>
<td>Frequency Domain Response</td>
<td>Assignment 2: Vortex modelling</td>
<td>Wednesday, week5</td>
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<td>4.</td>
<td>26 August</td>
<td>Time Domain Systems and Impulse Response</td>
<td>Assignment 2: Vortex modelling</td>
<td>Wednesday, week5</td>
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<td>5.</td>
<td>2 September</td>
<td>Tuition Free Week</td>
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<td>6.</td>
<td>9 September</td>
<td>Profiling with TEM</td>
<td>Assignment 3: Fitting of Plates to TEM data</td>
<td>Wednesday, week7</td>
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<tr>
<td>7.</td>
<td>16 September</td>
<td>Response and Modelling of discrete targets</td>
<td>Assignment 3: Fitting of Plates to TEM data</td>
<td>Wednesday, week7</td>
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<tr>
<td>8.</td>
<td>23 September</td>
<td>None (reserved for Proj302)</td>
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<td>9.</td>
<td>30 September</td>
<td>Tuition Free Week</td>
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<td>10.</td>
<td>7 October</td>
<td>Decay Curves and Sounding for TEM</td>
<td>Assignment 4: Layered Earth Modelling</td>
<td>Wednesday, week9</td>
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<tr>
<td>11.</td>
<td>14 October</td>
<td>Noise, Anomalous Responses and Improving Signal</td>
<td>Assignment 4: Layered Earth Modelling</td>
<td>Wednesday, week9</td>
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<tr>
<td>12.</td>
<td>21 October</td>
<td>Magnetotelluric Methods</td>
<td>Assignment 5: Magnetotelluric Modelling</td>
<td>Wednesday, week11</td>
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<tr>
<td>13.</td>
<td>28 October</td>
<td>Natural Sources and Sounding</td>
<td>Assignment 6: GPR and Near-surface EM field exercise</td>
<td>Wednesday, week13</td>
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<tr>
<td>14.</td>
<td>4 November</td>
<td>Ground Penetrating Radar and Radiometrics</td>
<td>Assignment 6: GPR and Near-surface EM data reduction</td>
<td>Wednesday, week13</td>
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<tr>
<td>15.</td>
<td>11 November</td>
<td>Study Week</td>
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<td>18 November</td>
<td>Examinations</td>
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<td>November</td>
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<td>25 November</td>
<td>Examinations</td>
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