Unit Outline

307728 Electromagnetic Fields in the Earth 202
Semester 2, 2014

Unit study package number: 307728
Mode of study: Internal
Tuition pattern summary: This unit does not have a fieldwork component.
Credit Value: 12.5
Pre-requisite units: 8127 (v.0) Advanced Calculus 201 or any previous version
OR
8648 (v.0) Mathematical Methods 201 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: Vassili Mikhailstevitch
Phone: 4976#
Email: V.Mikhailstevitch@curtin.edu.au
Building: 613
Room: 4H29

Teaching Staff:
Name: Robert Galvin
Phone: +618 92664973
Email: Robert.Galvin@curtin.edu.au
Building: 613
Room: 4H34

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
Electrostatics, Coulomb's law, capacitance, dielectrics, magnetostatics, resistance and current flow, Biot-Savart law, Ampere's law, permeability and magnetic materials, Faraday's law, mutual and self inductance, Maxwell's equations, EM plane waves, reflection and refraction of plane waves, EM waves in dissipative media, magnetic and electric dipole radiation.

Introduction
Welcome to Electromagnetic Fields in the Earth 202. This unit is designed to equip students with the basic knowledge of the important processes that govern the storage, coupling and transport of electromagnetic energy.

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. Describe the basic principles of electrostatic and dielectric physics</td>
<td><img src="/images/lightbulb.png" alt="Lightbulb" /> <img src="/images/pencil.png" alt="Pen" /></td>
</tr>
<tr>
<td>2. Describe the basic principles of magnetostatics and the time-varying magnetic fields in the earth</td>
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</tr>
<tr>
<td>3. Apply Faraday's Law, Ampere's Law and related relationships to simple electrical systems (geological)</td>
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</tr>
<tr>
<td>4. Manipulate Maxwell's equations and apply these to simple earth systems</td>
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</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
This course has two components composed of:
1. Lectures designed to provide you with insights into electromagnetic fields in the context of geophysical exploration.
2. A workbook composed of exercises where you are given the opportunity to apply the concepts introduced in class and demonstrate your understanding of the material.
Learning Resources
Recommended texts
You do not have to purchase the following textbooks but you may like to refer to them.


Other resources
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>Assignments (weekly workbook questions)</td>
<td>100 percent</td>
<td>Week: Every teaching week  Day: Friday  Time: 1 pm</td>
<td>1,2,3,4</td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

1. Your progress on the study will be assessed during the course of the term. Criteria of the assessment are determined by the unit learning outcomes.

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

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.

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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.

Pass requirements
Completion of the assignment 25%
Demonstrated understanding of the subject matter of the assignment 50%
Presentation of the material 25%

Referencing style
The referencing style for this unit is Chicago.

More information can be found on this style from the Library web site: library.curtin.edu.au.

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
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 at a date to be advised at the end of the semester.

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 speak to the Student Equity Advisor Team member in your Faculty. Contact details are at: http://eesj.curtin.edu.au/contact.html

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://unilife.curtin.edu.au/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:

All lectures and assignments are updated.

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>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>28 July</td>
<td>General introduction to EM field propagation and Maxwell’s Equations</td>
<td></td>
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<tr>
<td>2.</td>
<td>4 August</td>
<td>Concepts in EM and the history of electromagnetism</td>
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<tr>
<td>3.</td>
<td>11 August</td>
<td>Electrostatics, Coulomb’s Law, Capacitance, Dielectrics and related topics</td>
<td>Assignment 1</td>
</tr>
<tr>
<td>4.</td>
<td>18 August</td>
<td>Magnetostatics, Resistance, Current flow, Circuits, and EM devices</td>
<td>Assignment 2</td>
</tr>
<tr>
<td>5.</td>
<td>1 September</td>
<td>Tuition Free Week</td>
<td></td>
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<td>6.</td>
<td>8 September</td>
<td>Faraday’s Law, Ampere’s Law</td>
<td></td>
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<td>7.</td>
<td>15 September</td>
<td>Electrical and Magnetic Properties of Materials – Medium Dependent Parameters</td>
<td>Assignment 3</td>
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<tr>
<td>8.</td>
<td>22 September</td>
<td>Maxwell’s Equations in detail</td>
<td>Assignment 4</td>
</tr>
<tr>
<td>9.</td>
<td>29 September</td>
<td>Tuition Free Week</td>
<td></td>
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<tr>
<td>10.</td>
<td>6 October</td>
<td>Electromagnetic boundary conditions</td>
<td>Assignment 5</td>
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<tr>
<td>11.</td>
<td>13 October</td>
<td>EM fields at high frequencies</td>
<td>Assignment 6</td>
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<tr>
<td>12.</td>
<td>20 October</td>
<td>EM fields generated by Magnetic and Electric Dipole radiation on the Earth</td>
<td>Assignment 7</td>
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<tr>
<td>13.</td>
<td>27 October</td>
<td>Application of EM in Geophysics</td>
<td>Assignment 8</td>
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<tr>
<td>14.</td>
<td>3 November</td>
<td>Review and Revision</td>
<td></td>
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<tr>
<td>15.</td>
<td>10 November</td>
<td>Study Week</td>
<td></td>
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<tr>
<td>16.</td>
<td>17 November</td>
<td>Examinations</td>
<td></td>
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<tr>
<td>17.</td>
<td>24 November</td>
<td>Examinations</td>
<td></td>
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