The University of New South Wales
School of Electrical Engineering & Telecommunications

ELEC4011
Ethics & electrical engineering practice

Session 2, 2007

“The world is all grown strange. [said Éomar.] ... How shall a man judge what to do in such times?”
“As he ever has judged,” said Aragorn. “Good and ill have not changed since yesteryear; nor are they one thing among Elves and Dwarves and another among Men. It is a man’s part to discern them, as much in the Golden Wood as in his own house.”

(Tolkien 1954)

Ethics is about behaviour; in particular, it can guide us when answering questions posing, “What should I do when ...” There is nothing more fundamental to developing as a person than learning how to behave.

This course is intended to enhance your ability to analyse ethical problems, determine a plan of action, and articulate this resolution, primarily in the context of engineering, but also in your wider life. A further expectation is to provide some practical guidance for practising engineers, especially those working in large organisations under strong commercial forces. The ethical analysis will be specifically informed by the formal guidance provided by the Institution of Engineers (IEAust, 2000).

This course is the final, formal step in the non-technical, professional part of your undergraduate education. Apart from ethics, it involves the Industrial Training requirement specified by IEAust.

The primary course objectives are that students will

- learn how to comprehend and critically examine ethical arguments;
- identify ethical problems in an engineering context and formulate and communicate consistent, coherent responses to them;
- examine the social context of engineering; and
- explore an engineer’s rights and responsibilities.

Additionally, students will improve their skills in gathering and synthesizing information, in the oral and written presentation of arguments, in listening, and in working with other people, some of whom will have beliefs very different from your own. It is clear these
objectives can be met only when students actually engage in arguing (both written and oral) about ethical questions. The assessment tasks and class format are designed with this in mind. (There is an explanation of how these objectives relate to UNSW’s graduate attributes in Appendix 2.)

CLASSES

You will discover the core material of the course by reading the prescribed textbook, instead of at lectures. A reading guide (Outhred & Skinner 2001) for the text can be found on the ELEC4011 web-site. You will test your understanding of this material at the tutorial classes.

Lectures are scheduled for Mondays, 5 pm. There will not be a lecture every week; only 8 lectures in total. In four of these you will be introduced to the main themes of the course: how to identify an ethical problem and how to argue its resolution. To illustrate this, in the other lectures you will hear some guests speak on specific, practical ethical problems.

After lectures in Weeks 1 & 2 watch the noticeboard or web-site for the timetable of the others. Tutorials begin in Week 3; your tutorial group will meet a total of 10 times. You have enrolled in a tutorial group; you must attend this group all session. The tutorial programme is detailed below.

You will find this course more fun than you expect. Every year students are different but every year it is a pleasure to see them get passionate & care about something. Whatever else, make sure you ENJOY YOURSELF. We enjoy this course, too.

Dr Iain Skinner (Course Co-ordinator) & the other Tutors
ASSESSMENT

There are two components to your final mark in ELEC4011: an exam and tutorial work. You must achieve a satisfactory level of performance in both the examination and the tutorial-based work to pass this course. Also, until you submit your report on industrial training, your mark for this course cannot be finalised. If you have passed this course, but not completed your industrial training, then your mark will remain as WD.

The formal examination (2 hours) will follow Session 2. It is worth 50% of your final mark in this course. Part A (30%) requires you to answer 6 short questions (from 8 given). These require specific, limited information as their answers. Some may ask for definitions or descriptions, some for explanations, and some for properties of something. These questions allow you to show the knowledge you have learnt. Part B (20%) requires you to discuss 2 (from 3 given) situations from the perspective of the ethics involved: what has happened and what should occur & why. These questions let you identify ethical issues and argue your responses to them. The exam can ask about anything from (i) lectures, (ii) any of the topics (core ethical issues — obviously specific cases vary from class to class) covered in the tutorials (at least 1 seminar topic is chosen for the exam each year), (iii) the prescribed syllabus & text, or (iv) the supplementarty readings.

There are several tutorial-based tasks.

- You will participate in the presentation of two group seminars. (These will each count 10% of your final mark.)

- You need to attend all 10 tutorials and participate in the discussions. (Your mark for this counts as 20% of your final mark.) If you do not have a formal explanation for missing a class, your participation mark will be reduced.

- You must submit a formal written report on an approved topic. (This earns 10% of your final mark.)

These tasks, too, are about you identifying ethical issues and arguing your responses to both these and the ideas presented by your class-mates. Please note that marks will be moderated across all the tutorial classes to ensure equity. Any numbers given by your tutor only have meaning inside your class.

Seminars:
You will present your seminars as part of a group of 4 students. There is some choice in the formation of groups. You need to complete & submit the Seminar Group Preference Form (mauve) at the end of this hand-out so that groups can be organised, topics allocated, and you can start preparing your seminars. The allocation of topics & the groupings of four students per group will be announced on the course noticeboard & web-site by Monday, week 4. Detailed description of the seminars’ requirements can be found below. This includes the topics that will be presented by your tutors as well as those presented by students.
Reports:
Each student is required to write a formal report (2000 ± 200 words, excluding abstract & references) on a prescribed topic. You need to complete & submit the Report Preference Form (mauve) at the end of this hand-out so that your report topic can be allocated. Detailed description of the report’s requirements, and the circumstances in which we may require resubmission, can be found later in this handout, where there is also a list of topics.

Industrial Training
The requirements for your industrial training and the associated report are available from the Faculty Office (Faculty of Engineering (UNSW) 2006).

Plagiarism
Students must not commit plagiarism, i.e. they must not use the work of others without proper acknowledgement. They must not do it either in a seminar presentation or in a written report. For example, any diagram or picture taken from The Web and used in a presentation or a report must have the source acknowledged in the caption (on the slide).
Any plagiarism will be referred to the Head of School for further action. For a discussion of what is, and is not, plagiarism see Learning Centre (2005), or ask us. More information about plagiarism is the in Appendix.

TUTORIALS (SEMINARS)
Tutorials will commence in Week 3 and run for 10 meetings. On each occasion, there will be discussion of ethical issues as they apply in (electrical) engineering practice. Each student must attend the classes of his/her allocated tutorial group.
From Week 5 the seminars will consist of a presentation by a group of 4 students on one of the topics listed below. (Each student participates in presenting TWO seminars.) In these presentations, the group is expected to give a comprehensive coverage of the ethical implications of the topic. This necessarily involves a description of the problem including a clear statement of the questions that you are attempting to answer. Being able to formulate and ask appropriate questions is an important skill and marks are influenced by the quality of your questions. There should be an analysis of various ethical viewpoints that might be adopted in answering your questions and some conclusions must be attempted. The group will be expected to defend the conclusions it draws. Possible more general ethical implications associated with the topic should be investigated. Students are expected to research their topics.
Presentations are expected to last between 40 and 50 minutes, and to be followed by general discussion. One student in the group will be expected to chair the session and to lead the ensuing discussion. That student need not participate in the formal presentation. All students in the audience will be expected to contribute to the discussion. In particular, all students in the tutorial class must listen to the presentation and identify a relevant question to ask the presenting group.
Each group must prepare a one page summary of the ethical problems posed & their conclusions, and distribute copies to all present at the seminar. Preparation and copying of this sheet is the group’s responsibility, as is the provision of any audio-visual equipment that is used, except for that which comes with the tutorial room.

Presentations’ assessment

In preparing your seminars, take careful account of the following allocation of marks.

Content: technical background & social context (4)
Content: problem identification, ethical reasoning & argument, conclusion (15)
Content: structure, persuasiveness (5)
Presentation: clarity & conciseness (4)
Discussion: leading discussion, answering questions (6)
Teamwork (3)
Acknowledging sources, etc (1)
Summary sheet (2)

This gives a total of 40 and these marks are then divided amongst the group’s members in accord with specific information provided by those same group’s members. Incomplete groups receive an allowance for being short-handed.

The mark for leading the discussion will be determined by the presenting group’s response to the questions asked by the other students and the tutor, and asking these suitable questions contributes to the participation mark of the others. Students must not read from prepared scripts in an oral presentation. Working from notes makes it far more engaging and interesting. Remember, students must not commit plagiarism.

Groups

Your tutorial class is strictly limited to 16 students and presentations will be made by groups of 4 students. You can express preferences to help us organise the groups. See the Seminar Group Preference Form (mauve, attached to this hand-out). You must submit this to us by 2 pm Wed 8 Aug.

The allocation of seminar topics will then follow. These will be assigned on a random basis and will be announced by Monday of Week 4 on both the noticeboard & the web-site.

SEMINAR TOPICS

Under the general headings given, students are required to identify some specific ethical questions, of interest to engineers, and then attempt to answer these questions. They are also expected to provide some general ethical material that is background but necessary to understand the topic. (Two exam questions will share backgrounds with two topics listed here.)
The first two tutorials will be chaired by your tutors, and will address these topics: Ethical Issues in Business (Week 3) and Whistleblowing Case Studies (Week 4). The other eight tutorials involve student presentation of the following topics:

A. **Environmental ethics, waste & the electronics industry**  
   Reference must be made to IEAust’s environmental guidelines (IEAust 1992) and to the concept of sustainable development.

B. **Engineering as social experimentation: the case of portable entertainment devices**  
   To what extent are engineers, who develop new technology, responsibility for resulting changes in society? What are the engineers’ responsibilities if the changes are destructive?

C. **Workplace behaviours**  
   The workplace involves interpersonal relationships and consequent ethical considerations about behaviour, e.g. bullying, harrassment, nepotism, appraisals, rewardings, etc. Under Australian legislation, an employer must take “all reasonable steps” to prevent discrimination & harrassment in the workplace (Australian Human Rights and Equal Opportunity Commission 2001). UNSW has a set of relevant policies (UNSW 2001).

D. **Genetic screening**  
   High speed computation allows routine screening of human DNA for a variety of reasons. What limits should be placed on such screening? Who is entitled to know what is found? What does “knowing something” to do a person?

E. **Automated surveillance and decision making**  
   The ethics of having machines make decisions for humans & the use of automatically operated systems.

F. **Intellectual property**  
   The rights and duties of both those who own & those who want to use intellectual property (of relevance to engineering).  
   Note that this is primarily about discussing ethics not laws.

G. **The world-wide web & finding information**  
   The ethics of this all-pervasive, intrusive telecommunication system. Who provides the information on the web? Who controls it? How is information accessed? What about advertising?

H. **Precision guided weapons**  
   Ethical issues surrounding the role of engineers in the development and use of weapons.
WRITTEN REPORTS

Students are required to submit a formal written report exploring ethical issues in electrical/telecommunication engineering. Your specific topic will be assigned to you on the basis of the preferences you submit using the Report Topic Preference form (mauve).

Your report must contain a discussion of the ethical issues associated with the topic and related to engineering; it must consider both sides of any argument; it must clearly identify your conclusions about the issues and why you reached them. (No credit will be given for surveying the technology or laws involved.)

Requirements:

The main body of the report (including introduction & conclusion) should be 2000±200 words; the abstract about 100 words.

Your report must include some discussion of the IEAust Code of Ethics and its implications for your particular question, and also some analysis of your question using each of the four ethical frameworks presented in this course: i.e. rights, duties, virtues and utilitarianism.

Students must research their topics. Your references must be sufficient to demonstrate familiarity with the important, current issues, and need to be fully documented. Use the Harvard (i.e. author-date) system for your references. (This hand-out uses the Harvard system; for more details see Learning Centre 2003.)

Before writing your report, take note of the marking criteria as detailed on the Report Cover Sheet (yellow, attached to this hand-out) and review the check-list on its reverse. Be aware that we can require you to revise and resubmit any report that does not conform to the minimum standards prescribed by the School (School of Electrical Engineering & Telecommunications (UNSW) 2004). Any such resubmission will get a maximum mark of 5.

Remember, students must not commit plagiarism, i.e. they must not use the work of others without proper acknowledgement. Students must identify direct quotations correctly and acknowledge each source at each point that it is directly quoted (or paraphrased) in the text of the report.

Submission:

Your report must be placed in the Assignment Box outside Room G12A, by 5.00 pm, WEDNESDAY 10 OCTOBER, with the cover-sheet completed and attached. This cover-sheet (yellow) is at the end of this hand-out. Without it, you cannot be certain that the report will ever get to us! Late reports will be penalised. As part of our plagiarism detection system, you are required to email an electronic copy of your report. This must be in pdf-format and the file’s name must include your student number, in the form zxxxxxxx_ethics_report_2007.pdf. If you do not provide this e-copy, then your report will not be marked.
REPORT TOPICS

You must submit your Report Topic Preference Form (mauve, attached to this handout) by 2 pm Wed 8 Aug. The allocation of topics will then follow and will be available Monday of Week 4 on the noticeboard & the web-site.

Your topic preferences must be either selected from the following list or be negotiated with Dr Skinner. A quota applies to each topic and earlier requests will be given priority.

1. Reverse engineering
2. The ethics of liability insurance
3. Life support systems [medical, not space exploration]
4. Use of high frequency electromagnetic radiation
5. High voltage power-lines
6. Whistleblowing
7. Professional codes of ethics
8. Technology transfer & sustainability
9. What makes technology appropriate for a specific social context?
10. Regulation & freedom on the world-wide-web
11. Planning approvals for large engineering projects
12. Databases and privacy
13. Image recognition & surveillance
14. Microchipping people
15. Disposable, repairable or built-in obsolescence?
16. Tissue engineering & stem cells
17. Cybersecurity: whose responsibility?
18. Nuclear enrichment & waste disposal
19. Expert witnesses, forensic engineering, & the courts
20. Transgenic organisms
21. Automated weapons delivery systems
22. Genetic engineering of bacteria
23. Engineering standards & intellectual property
24. Private ownership of “essential” infrastructure
25. Climate change and greenhouse gas offsets

You may suggest another topic, but it would need Dr Skinner’s approval.
SOME RESOURCES, GETTING HELP, ETC.

Apart from the course guide, this hand-out includes copies (lemon) of IEAust’s *Code of Ethics* and *Environmental Principles* (IEAust 2000 & 1992, respectively). These are followed by miscellaneous readings giving some perspectives on professional ethics for engineers and some real cases which pose ethical questions for you to consider. There are also the hand-outs (green) that accompany the first two tutorials, the report cover-sheet (yellow), and forms (mauve) for expressing preferences about report topics and partners for the seminar presentations.

**Books**

The prescribed textbook is Martin & Schinzinger (1996). *Students are expected to be familiar with and understand the ideas therein*. The 2nd edition will be adequate for this purpose.

Additional helpful material about ethical issues can be found in Beder (1998), Grace & Cohen (1995), Johnson (1991) & Unger (1994), with the first two giving a more Australian emphasis. You may find such books very bland and formal. There are many better written and more entertaining ones that pose significant, timeless ethical issues in works of fiction, yet relevant to engineers, e.g. Asimov (1950), Huxley (1932), Shelley (1818), Stevenson (1886), and Orwell (1949).

References that might help you with your presentations & report include books such as Sides (1999) and Markel (1994). The definitive arbiter on matters of style, though, is the Australian Government’s style manual (Ausinfo 1994).

**Web-based material**

This course has a home-page which can be accessed from the School’s list of courses (School of Electrical Engineering & Telecommunications (UNSW) 2004). If you wish to use it from outside the UNSW domain, then you will need a password. Please see Dr Skinner. The home-page contains material such as the Reading Guide to the text and links to various resources on-line resources.

There is a wealth of case studies related to engineering ethics on the Web. We encourage you to explore it, and think about what you find. Do you agree with it? Why?

**The Learning Centre**

The Learning Centre is located in room 231 of the Library building or on-line at www.lc.unsw.edu.au. It provides free and confidential academic support services for students. These include assistance with communicating information in both written & oral forms. Approach the Centre directly for assistance on an individual (or group) basis.

Any student who, by reason of disability, needs modification of her/his teaching or learning environment is encouraged to contact Dr Skinner, Dr Ambi, or the University’s Equity Officer (Disability) on 9385 4734.
You need to be informed on the School’s (School of Electrical Engineering & Telecommunications (UNSW) 2007) and University’s (UNSW 2004) policies about students’ responsibilities, academic & other misconduct, special consideration, conduct of examinations, and the submission & assessment of assignments.

Notices for this courses, including topic allocations and tutorial groups, as well as the lecture schedule, will be placed on the 4th-year noticeboard opposite the School Office and on the course’ web-site.

Each tutorial group is autonomous. Any questions related to tutorials should be directed to your tutor. Matters concerning course administration should be referred to Dr Skinner.

Finally, here is our best advice on how to succeed in this course.

(i) Learn the key principles so that you can identify ethical issues and engage in ethical debates. Working through the textbook is an excellent way to start, but only a start.

(ii) Practise these skills in discussions, and not only in your designated tutorial times. Listen to others.

(iii) Complete all the tasks required at the appropriate time.

(iv) Above all, make sure you are enjoying yourself and finding points of interest, for then the rest will follow. If you haven’t found anything of interest in this course, then start asking questions, and please tell us.
REFERENCES


Stevenson, R.L. 1886, *The Strange Case of Dr Jekyll and Mr Hyde*, ... Edinburgh.


Note: Publishers not given for years earlier than 1960.
Appendix 1
On Plagiarism

The following is an official, now mandatory inclusion in all UNSW course handouts. 
"Plagiarism is the presentation of the thoughts or work of another as ones own. ¹ Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another persons assignment without appropriate acknowledgement
- paraphrasing another persons work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed. ²

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

"The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

"Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

"The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at: www.lc.unsw.edu.au/plagiarism
The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

¹Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.
²Adapted with kind permission from the University of Melbourne.
Individual assistance is available on request from The Learning Centre.

“Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.”

Appendix 2
On teaching & learning, graduate attributes, etc.

UNSW has a set of ‘graduate attributes’ (UNSW 2003). This course is designed to provide opportunities to develop further the following attributes.

- an in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context (#2);
- the capacity for analytical and critical thinking and for creative problem solving (#3);
- the ability to engage in independent and reflective learning (#4);
- information literacy (#5);
- an appreciation of, and respect for, diversity (#7);
- a respect for ethical practice and social responsibility (#11); and
- the skills of effective communication (#12).

The Guidelines on learning that inform teaching (UNSW 2006) explain how and why you need to engage in ‘active learning’ to acquire understanding of material.

Active learning means you need to identify ethical problems for yourself, and then work out how to resolve them. Your tutors cannot know what problems are of interest to you, and they certainly won’t provide you with an official, correct response that you need to know. Ethics is not like that. Active learning means that you should come to tutorial classes prepared for the topic of the day’s discussion. Remember that the tutorials involve students arguing the resolution of ethical problems identified by themselves. The tutors simply facilitate this. This means that you must communicate your ideas to each other.

The assessment tasks have been designed with all this in mind. Examination questions will measure your acquisition of knowledge and development of critical thinking & problem solving. The seminars and report will require you personally to identify suitable questions and then find and evaluate information, reflect on its implicationse, and accurately communicate your responses. A successful group presentation will require you to work as a team. Being part of a tutorial class will cause you to see several different perspectives on matters discussed. In all cases you will need to communicate your ideas effectively, while conforming to professional standards and conventions. Completing all activities will give you more practice with time-management.