

UNSW Australia
GSOE9510
Session 2, 2015

Ethics & Leadership in Engineering — the Students' Guide

Course Staff

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You will also have another class-room teacher.

Consultations: Students are encouraged to use the on-line discussion tools found on the course moodle-site.

If you wish to speak to us, we recommend you make an appointment by email.

Course details

Units of Credit: GSOE9510 is a 6 UoC course; we emphasis that 6 UoC means 6 UoC: the *indicative student workload is 150 hr* (i.e. 12 hr/wk), spread over the session. Of course, the amount of work you actually choose to do depends upon your ambition and your ability.

Classes: GSOE9510 has a single class of 3 hours which meets each wee from 3 to 6 Wednesdays, *starting in Week 1* and continuing to Week 12. Sometimes part of the class-time will be spent in the lecture theatre (with the undergraduates); other times we will be in your tute room. You can check the weekly venues of classes on moodle.

Course Information

Context and aims

This course is part of the non-technical component of your professional education.

Aims: *This course is primarily designed to enhance your ability to (i) analyse ethical problems, determine a plan of action, and articulate this resolution to others, and (ii) make decisions about technological innovations and to, thereby, engage productively in the leadership of various groups.* In both cases we are primarily interested in the context of engineering, but the skills apply equally to your wider life.

A further expectation is to provide you with an understanding of the complex, interlocking organisations that form the wider, non-technical context in which engineers practice,

and with some practical guidance both for interacting professionally with other engineers, wherever they might be, and for behaving when practising as engineers, especially within large organisations under strong commercial pressures. Ethical analyses will be specifically informed by the formal guidance provided by Engineers Australia (2010).

Prerequisites & assumed knowledge: There is no prerequisite for this course but we assume that you have worked previously on an engineering project of some description.

Parallel Teaching: Some of the class-time will be lectures shared with the undergraduate course ELEC4122 which has some common content.

Learning outcomes

After the successful completion of this course, the student will be able to

- describe important aspects of the social, environmental, regulatory, & organisational context of engineering;
- identify ethical problems, particularly in the context of engineering practice;
- formulate and communicate consistent, coherent responses to such problems, using the formal language of ethics, and critically examine the ethical arguments proposed by others;
- explain details of an engineer's rights and responsibilities;
- participate in both making and criticising technocratic decisions;
- use different criteria, including aspects of sustainability, to evaluate technological innovations;
- help lead, i.e. facilitate the effective working of, a team (be it a technical project team or those involved in using an innovation); and
- identify ways to assess and reduce risks, especially those associated with human limitations.

In summary, we expect you will improve your ability to consider problems from *multiple perspectives* and make decisions associated with *uncertain, inconsistent and imprecisely defined* requirements, as is often the case when *people are involved*.

Additionally, students are expected to improve their skills in gathering and synthesising information, in the oral and written presentation of arguments, in listening, and in working with other people, some of whom will have ideas and beliefs very different from your own. It is clear these objectives can be met only when students actually engage in discussing and debating (both written and oral) the course of action which should be followed, i.e. the 'best' decision.

Teaching strategies

GSOE9510 consists of the following elements: “lectures”, tutorial-based activities, on-line activities, and self-paced learning.

Self-paced learning

This is not a conventional lecture course. Rather than having a set of traditional, weekly, ‘instructional’ lectures, this course is structured as a reading course. This means that you will only develop your understanding of the core material by reading the prescribed resources, and not at lectures. Additionally, there will be structured, co-operative reading and learning. You will prepare some learning materials based on a chapter that you read, and share these with other students.

It is an important professional skill to be able to search through information and identify what you need; being able to discipline your own learning will stand you in good stead for the rest of your lives. It is also important to be able to reflect on what you have learnt. For without doing so you cannot identify what you yet need to learn.

Of course, no conventional ‘lecture notes’ will be handed out, but you will receive suggested readings.

Key reading resources

Instead of needing to read everything on the list, you can share the task. You can take advantage of work done by each other. You will each have an assigned reading and from this develop a learning resource to be placed on moodle and explaining key concepts of the GSOE9510 syllabus.

Classes

Nevertheless, students are expected to attend the classes.

Formal ‘lectures’ merely introduce the main themes of the course, provide some motivation, and present the fundamental concepts you must understand.

In other classes we will have visitors who will discuss specific topics, set in a specific context.

The other classroom activities are to provide structured reflection on some of the ideas explored during the course. They will afford you the chance to share your understandings and experiences with each other. Once again you will practise key skills. The syllabus of this course is not such that you can learn without active engagement with other people.

Moodle

There will be an active on-line site for this course within the moodle site:

moodle.telt.unsw.edu.au/login/index.php

Team projects

There are **two** team projects. These will give you an opportunity to practise what is learnt about teamwork and leadership as well as develop some of the other learning objectives of the course.

Note that these ‘teaching strategies’ are supported and guided by *Guidelines on learning that inform teaching at UNSW* (UNSW 2013a). In particular, “engaging students in learning; contextualise learning; be inclusive; design curriculum to engage, contextualise, and be inclusive; and teach to engage, contextualise and be inclusive.”

Be assured that you will find this course more fun than you initially 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.

Assessment

There are several components for the assessment in this course, as detailed in Table 1. Note that this assessment schedule *differs from that used in any previous year*.

You get an an exam mark x and an in-session mark y .

Table 1 Assessment weightings

<i>assessment task</i>	<i>% weighting to y</i>
final exam e	0
class-test t	0
3 homework assignments	12
classroom participation	12
moodle participation	4
learning resource	10
simulation project	12
total in-session y	50

The weightings for the class-test and final exam are flexible. These will earn you a mark given by

$$x = 50 \times \max(t/3 + 2e/3, t/5 + 4e/5)$$

where e and t are your exam and test marks, respectively, normalised to be out of 1. Your final, summative course mark is given by

$$\text{final mark} = x + y \times \frac{1}{2}(1 + \tanh[0.6x - 13.5]).$$

If x is satisfactory, your exam and in-session marks each contribute half your final mark; if x is unsatisfactory, your final mark consists almost entirely of x . Thus, *you must get a satisfactory mark for the combination of final exam and the class-test marks in order to pass this course.*

The “due dates” for all assessment tasks are given in Table 3 below.

Final Examination: The written examination at the end of session will be of 2 hr duration. It will test critical thinking and general understanding of the course material in a controlled setting. It will be an open-book exam.

Class-Test: This closed-book test of 1 hr duration will test basic knowledge of the core ideas and key terms of the course. It will take the form of short answer questions.

Homework Assignments: You will have THREE short homework assignments spaced through the session. Each will require you to write 150 to 250 words. Full details of this task's requirements are in the relevant document that will be given out later.

In-session Participation: You are required to participate during classes. This means *working on the activities, actively listening and appropriately contributing to discussions*, not simply being physically present. There will be no marks given for mere presence. If you do not do these things, you will not learn what we expect you to learn this session, notably how to respond when asked a question. Classroom discussion will occur in a small group context. Each of you *must take aturn at recording notes* (minutes) about your small group's discussion.

If you do not have a formal, acceptable explanation for missing a class, your participation mark will be reduced.

Moodle Participation: You are also expected to contribute to the on-line discussions about the topics introduced by your classroom activities. At the end of session your ‘best’ posting — as nominated by you, yourself — will be marked. Further details about how this is to be done will be found elsewhere.

Simulation Project: In this activity, you will work in a team of 3 to 6 students. The teams will compete against each other to win a simulation game that will be played using moodle as the interface. The game will run over several weeks, commencing in Week 3. There will be time between rounds of play for your team to discuss its strategy. The team will receive a mark on the basis of how well it functions and also its success in the game. After the game concludes, you will be required to write a short *individual* reflection statement about how it went. Full details of this task's requirements are in separate documents.

Any student who is repeating this course will participate in a different project (so that the game is not spoiled for others).

Learning Resource: Your team (same team as above) will also develop an on-line learning resource for the class, based on an assigned a key reading relevant to this course. This resource is expected to use the ideas explored in this reading and, of course, the learning objectives of this course. The format of this resource is at the discretion of the team. Teams are also required to respond to any questions that will be posed on moodle in response to the resource developed, though you are not necessarily expected to have the definitive answer. Additionally, you as an individual must ask questions about TWO other resources, provided by the other teams. The resource is expected to take a typical student only 10-15 minutes to work through. A few readings are longer and will be given to larger teams. The resulting resource will, of course, be longer in this case. Full details of this task's requirements are in separate documents. *All learning resources are due Friday 12 Sept (Week 7).*

Team membership: To assist in putting the teams together, complete the team membership form (purple) accompanying this handout. *Hand this back in class in Week 2.* Teams will be announced on moodle at the start of Week 3. *You will be in the same team for both the Key Reading and the Simulation Projects.*

Note these general considerations about your assessment.

- (i) All assessed tasks will be graded according to the academic merit (see nominated learning objectives) of the individual piece of work.
- (ii) Being able to formulate and ask appropriate questions is an important skill and, where relevant, marks are influenced by the quality of the questions you raise.
- (iii) Marks are also influenced by your ability to communicate your ideas clearly and concisely.

In all assessment tasks, you should read the instructions and pay attention to formal requirements detailed on any relevant cover-sheet. There is a standard penalty for late submission of a task: $\text{given-mark} = \text{raw-mark} \times 0.8^n$, where n is the number of days late.

Course Schedule

The schedule for the first few weeks is shown in Table 2. Obviously, this schedule is subject to change. Please confirm the schedule on-line where it can be kept up-to-date. Its final form depends on the availability of our guest lecturers.

Table 2 Anticipated schedule for the first few classes.

<i>week</i>		<i>learning focus</i>
1	'lecture' 2 hr activity	technology's context & organisations technology's context
2	shared lecture 1 hr activity	ethics in engineering; guidelines & motivations attitudes
3	shared lecture 1 hr activity	tbc lead or manage?

Assessment dates: The chapters for the learning resources will be allocated to teams in Week 3 and the learning resource must be submitted in Week 7 (Fri 11 Sept). The class-test will be in class in Week 10 (Wed 7 Oct). The final exam will be held after the end of the teaching session. These are all summarised in Table 3.

Table 3 Critical dates.

<i>week</i>	<i>date</i>	<i>activity</i>
Week 2	Tue	<i>students:</i> team membership confirmed
Week 3	Mon	<i>staff:</i> confirm teams & allocate resource chapters
	Wed	<i>students:</i> play Round 1 of simulation project
Week 7	Fri	<i>students:</i> submit learning resource
Week 10	Wed	<i>students:</i> class-test
Week 12	Wed	<i>students:</i> submit Part 2 of simulation project
<i>tba</i>		exam

Additionally, homework will be due given in class in weeks 4, 7, & 10. Each task will be due one week later, i.e. weeks 5, 8 & 11.

Resources for Students

As mentioned above, "lecture notes" will not be distributed. However, you will get some notes associated with the key ideas.

Prescribed textbook

Books are expensive. There is no single prescribed textbook set for this course.

Reference books

Instead, we have identified some excellent reference books that will support your learning.

Martin & Schinzinger (1996) covers the essential material about ethics, and relates this to engineering practice. The aspects related to leadership are supported by Northouse (2007) and strategy & technological innovation are discussed in Schilling (2008), neither of which is specific to engineering. A reference generally useful and also set in the context of (albeit civil) engineering is Beder (1998).

Other books

There are many, better written and more entertaining books that pose significant, timeless ethical issues in works of fiction, and yet relevant to engineers, e.g. Asimov (1950), Clarke (1965), Shelley (1818), Stevenson (1886), and Orwell (1949). Likewise, engaging writers (not those of textbooks) have explored the nature of leadership, organisations, and strategy, from the legendary Homer (750 BC, 720 BC) and Lao-Tzu (6th century BC), through the Renaissance (e.g. Machiavelli 1532), to modern authors (e.g. Tolkien 1954). Consider the contrasting approaches to leadership shown in Shakespeare's *Richard II* and *Henry V*. Musings on such things are as old as human society itself.

DVDs

In Week 1, you will watch the story of a celebrated "engineering achievement" (from *Constructing Australia* 2007). The Library has copies of other such stories and we encourage you to view a couple more during the rest of the session, particularly with friends.

On-line resources

Additional on-line resources relevant to these courses:

The Library: info.library.unsw.edu.au/web/services/teaching.html

The Learning Centre: www.lc.unsw.edu.au

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? Likewise, on The Web, there is plenty of free advice about leadership and strategies. Be aware, though, that much of this is in the context of businesses.

We invite students who find suitable material, including web-sites, to submit these to be made more widely available.

The Learning Centre

The Learning Centre is located in behind Student Central in the Chancellry. It provides free and confidential academic support services for students. These include assistance with communicating information in both written & oral forms. Given the nature of assessment tasks in this course, you may find this useful. You can approach the Centre directly for assistance on an individual (or group) basis, or you may choose to discuss your needs with Dr Skinner first.

Other Matters

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignments written by other students or material found on The Web. Plagiarism is considered a serious offence by the University and severe penalties may apply. **Any plagiarism will be referred to the Head of School for further action.** For more information about plagiarism, please see Learning Centre (2010), or ask us.

Continual Course Improvement

We are eager to learn from this year's experience, and thereby to improve the learning outcomes of current and future students. Students are invited to provide feedback (positive or negative) to the course convener or a tutor, at any time. There is a discussion forum ("suggestion box") on moodle and a box taken to lectures for this purpose.

At the end of the session you may be asked to participate in a voluntary, anonymous survey — CATEI — which is standard at UNSW.

Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the relevant Faculty & UNSW policies.

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 assessment tasks at the appropriate time, to the required specifications.
- (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, please tell us.

Course References

- Asimov, I. 1950, *I, Robot*, ... New York
- Australian Human Rights and Equal Opportunity Commission 2008, *Information for Employers*, [online] available: www.hreoc.gov.au/info_for_employers/index.html [accessed 3 July, 2008].
- Beder, S. 1998, *The New Engineer: Management and Professional Responsibility in a Changing World*, Macmillan Education, South Yarra.
- Clarke, A.C. 1965, "Dial 'F' for Frankenstein", *Playboy*, Jan, page numbers unknown. (collected and reprinted 1972, in *The Wind from the Sun*, Harcourt Brace Jovanovich, New York).
- Constructing Australia* 2007, television series, Australian Broadcasting Corp, Sydney.
- Dowling, D., Carew, A. & Hadgraft, R. 2010, *Engineering Your Future*, Wiley
- Engineers Australia 2010, *Our Code of Ethics*, [online] available: www.engineersaustralia.org.au/ethics [accessed 13 July 2012].
- Evan, W.M. & Manion, M. 2002, *Minding the Machines*, Prentice Hall
- International Institute for Applied Systems Analysis (IIASA) 2006, *What is technology?*, [online] available: www.iiasa.ac.at/TNT/index.html [accessed 16 June 2010].
- Kletz, T. 2001, *An Engineer's View of Human Error*, 3rd ed, Inst Chem Eng, Rugby (War)
- Kotter, J.P. 1990, *A Force for Change*, Free Press, New York
- Learning Centre (UNSW) 2010, *The Learning Centre Welcome*, [online] available: www.lc.unsw.edu.au [accessed 16 July, 2010].
- Machiavelli, N. 1532, *Il Principe* (English translation: *The Prince*), ... Florence.
- Martin, M.W., & Schinzinger, R. 1996, *Ethics in Engineering*, 3rd edn, McGraw-Hill, New York.
- Norman, D.A. 1998, *The Invisible Computer*, MIT, Cambridge (Mass)
- Northouse, P.G. 2007, *Leadership Theory and Practice*, 4th edn, Sage Publications, Thousand Oaks (Calif)
- Orwell, G. 1949, *Nineteen Eighty-Four*, ... London.
- Perrow, C. c.1984, *Normal Accidents*, Basic Books, new York
- Schilling, M.A. 2008, *Strategic Management of Technological Innovation*, 2nd edn, McGraw-Hill Irwin, Boston
- Shelley, M. 1818, *Frankenstein*, ... London.
- Stevenson, R.L. 1886, *The Strange Case of Dr Jekyll and Mr Hyde*, ... Edinburgh.
- Tolkien, J.R.R. 1954, *The Two Towers*, ... London.
- UNSW 2013a, *Guidelines on Learning*, [online] available: www.guidelinesonlearning.unsw.edu.au [accessed: 25 Jul 2013]
- UNSW 2013b, *Graduate Capabilities*, [online] available: teaching.unsw.edu.au/graduate-capabilities [accessed 25 Jul, 2013].

Appendix 1: Graduate Attributes

This course addresses the following Engineers Australia ‘Personal and Professional Skills or Capabilities.’

- team skills and leadership ability
- an understanding of and commitment to the ethical, social, cultural, and environmental responsibilities of the professional engineer.

This course also addresses a number of UNSW ‘Graduate Capabilities’ (UNSW 2013b).

- *Scholars who are* understanding of their discipline in its interdisciplinary context; capable of independent and collaborative enquiry; rigorous in their analysis, critique, and reflection; ethical practitioners; and capable of effective communication.
- *Leaders who are* capable of initiating as well as embracing change and collaborative team workers.
- *Professionals who are* capable of operating within an agreed Code of Practice.
- *Global Citizens who are* capable of applying their discipline in local, national and international contexts; culturally aware and capable of respecting diversity and acting in socially just/responsible ways; and capable of environmental responsibility.