ENGG 1803

PROFESSIONAL ENGINEERING

Unit of Study

Manual

2009

Faculty of Engineering

University of Sydney

CONTENTS

1. Introduction

The University of Sydney and the Institution of Engineers Australia (the professional engineering association that accredits engineers to practice) both require that the education of undergraduate engineers include the development of specific generic attributes.

The Engineers Australia attributes consistent with ENGG 1803 are an:

- ability to communicate effectively, not only with engineers, but the community at large
- ability to undertake problem identification, formation and solution
- ability to function effectively as an individual in multi-disciplinary and multicultural teams, with the capacity to be a leader or manager as well as an effective team member.
- understanding of the social, cultural, global and environment responsibilities of the professional engineer, and the need for sustainable development
- understanding of professional and ethical responsibilities and commitment to them. [*Source – IEAust*]

The University Graduate Attributes are expressed as the development of Scholarship, Global Citizenship and Lifelong Learning. These 3 broad attributes are supported through the development of five sets of skills or abilities.

- Research and Inquiry
- Information Literacy
- Personal and Intellectual Autonomy
- Ethical, Social and Professional Understanding
- Communication

[for more detail http://www.itl.usyd.edu.au/GraduateAttributes/policy.htm]

The Faculty of Engineering's interpretation of the University's Graduate Attributes emphasises the abilities of our graduates to:

- create new knowledge and understanding through research and inquiry
- use information in a range of contexts
- work independently and sustain ably, informed by openness, curiosity and a desire to meet challenges.
- hold personal values and beliefs consistent with their role within local, national, international and professional communities.
- recognise and value communication as a tool for negotiating and creating new understanding, interacting with others and furthering their own learning.

[http://www.itl.usyd.edu.au/GraduateAttributes/facultyGA.cfm?faculty=Engineering**]**

As you can see from these differing, yet complementary sets of graduate attributes the profession, the University and the Faculty all take the development of general academic and professional skills very seriously.

In ENGG1803 – Professional Engineering , this is reflected in the structure of the Unit of Study, the specific topics included in lectures and tutorials, the skills and commitment of the academic team and the way in which your contribution and work is assessed.

2. Objectives and Outcomes

Professional Engineering is intended to:

- create an awareness of the principles and processes of professional engineering, including social, economic and environmental aspects
- immerse students in the practical application of these principles and processes through structured educational experiences
- establish the academic requirements for the accessing and communication of information, both written and oral
- expose students to the skills of problem identification, formulation and solution
- allow students to function, individually and in teams, as professionals-in-training.

This Unit of Study will provide a basis for students to:

- develop an understanding of the principles and processes of professional engineering, including group work
- experience the practical application of professional engineering principles and processes to meet challenges and grasp opportunities in social, economic and environmental areas
- acquire and display the skills needed to function successfully in an academic environment
- understand and communicate the basics of engineering problem solving
- demonstrate the requirements of individual responsibility and team accountability, including time management, prioritising and decision making
- demonstrate an ability in report writing and other communication skills, including information gathering.

Key features of the **learning process** include:

- a series of lectures to all students that provide an introduction to key concepts and practices
- a team of lecturers drawn from all aspects of engineering
- demonstration exercises to support each key concept or skill
- application of all the skills in a team-based *design-and-build* engineering project running throughout the semester
- project teams of no more than 6 that will work in an independent, self-managed way, supported by a designated tutor
- Web-based support for all components of the Unit of Study at http://www.eng.usyd.edu.au/currentstudents/flexible1year/ENGG1803

3. Learning Approach

Developing an understanding of the elements of professional engineering is very different from learning technical engineering skills. There are no formulae to learn and apply; there is not even a set of right answers, though there are plenty of wrong ones. Hence a different learning approach is required. The essence of professional engineering is that you are dealing with people. Different people behave differently in the same, and different situations. The biggest challenge is rarely to work out what to do, but rather to communicate effectively to and motivate a group of people to work out what to do, and how to do it.

Hence it is crucial for you, the student, to arrive at your own understanding so that you can apply it in the varied situations you face in the future. In these circumstances, effective learning requires the learner's dynamic involvement. You cannot learn passively by simply listening to lectures and making notes - you must positively engage the material and experience of this course.

Through the conceptual material provided in lectures, the tutorials which apply these concepts in practice, your reading, and the assignments, particularly the project, you will learn to cope with the practical business difficulties of imperfect and incomplete information, conflicting information, divergent personal views and internal organisational politics. It will require you to actively engage in sorting, sifting, categorising, consolidating and transforming data.

The tutorials and the project, including the presentation require the ability to work effectively in teams with your fellow students, and to learn from one another's contributions. Hence it will be important for each student to develop the ability to effectively communicate their ideas, and listen to and respect the ideas of others.

Through exposure to a range of problems, you should start to be able to observe coherent patterns emerging. General principles will be drawn out to provide the basis for comparison and analysis in the real world. It will assist you in developing independent thought and responsible judgement.

4. Targeted Learning

As an introductory Unit of Study, Professional Engineering has been designed to meet the different needs of different students. Determination of the particular critical professional engineering skill needs of students will be determined through an assessment exercise early in the Semester.

In Week 2, all students will be required to complete a *professional engineering test*. This test will assess performance in key elements of professional engineering – creativity, design, problem-solving, project management and communication. In particular the test will employ the well-established MASUS test to provide a diagnosis of English academic writing skills

Performance in this test will provide the basis for allocating students to one of three cohorts:

- Students who perform adequately will proceed to the ***General Cohort,*** which includes a strong emphasis on exercising communication skills in presentations and preparing an engineering article and group reports;
- Students who are identified as needing to strengthen their communication skills will enter the ***Communication Cohort***, in which there will be a greater emphasis on enhancing these skills with the assistance of expert staff from the University Learning Centre:
- Students whose performance is judged to be of Distinction level or higher will be eligible to enter the ***EWB Cohort*** and undertake the *Engineering Without Borders Challenge* project.

All students will attend the same core lectures and complete similar assessment tasks. The only substantial difference is in the project, where the ***General Cohort*** will engage in a group design-and-build competition, the ***Communication Cohort*** will focus on a communication-related project, and the ***EWB Cohort*** will undertake the national *Engineering Without Borders Challenge* project.

Allocation to any cohort in no way determines or influences the marks that can be achieved. High Distinction and Fail performances are possible in any cohort.

5. Course Structure

Each lecture will introduce a new topic. In Weeks 1-3 and 5 the emphasis is on key attributes (ie professional engineering skills). In Week 4, the project will be introduced and the students will be provided with an introduction to the skills required to run a successful project. In Weeks 8 and 10 -12, the focus is on engineering skills (see Table). Lectures from University staff will be supplemented by specialist guest lecturers.

Tutorials will address, through practical exercises, the lecture topics.

Weeks 1-3, 5	Week 4,6	Weeks `7-11
Key Attributes • Information searching • Written and oral communication • Teamwork • Project management • Creativity and design • Problem solving • Leadership	**Project Development and Planning** ▪ Project technical information ▪ Project planning ▪ Organising your team ▪ Time management ▪ Design for the project ▪ Presentation skills ▪ Prototype trial ▪ Contest	**Engineering Skills and Challenges** • Ethics • Environmental sustainability • Professional liability • Occupational health and safety • Engineering and climate change

6. Basic Information

Credit Points	6		
Semester	One and Two		
Formal Contact Hours	4		
Timetable	Lectures	Tuesday and Thursday	10 -11
	Tutorials	Tuesday and Thursday	11-12 or 12-13
Location	See personal timetable		
Website support	The UoS Manual, all lecture material and information about assignment is available at: http://www.eng.usyd.edu.au/current-students/flexible1year/ENGG1803/		
Course Textbook	Ron Johnston, '***Professional Engineering***', McGraw Hill 2008: a compilation of chapters and articles designed to address the issues raised in this Unit of Study.		
Other Readings	Johnston, S., Gostelow, P., and Jones, E., *Engineering and Society: an Australian Perspective*, Longman, 2nd edition, 1999 – history of engineering, management, sustainability, ethics and professionalism.		
	Beder, S., *The New Engineer: Management and Professional Responsibility in a Changing World*, Macmillan, 2000 – engineering design, social responsibility, sustainability, role of experts, engineering ethics.		

7. Staff

Coordinator	Professor Ron Johnston (Australian Centre for Innovation – ACIIC)
Principal Lecturers	Don Scott-Kemmis (ACIIC) John Currie (ACIIC) Phil Rubie (ACIIC) Rodney Fiford (AMME) Associate Professor Tim Langrish (CHEM) Associate Professor Rob Wheen (CIVL)
Tutors	*to be advised*

8. Weekly Schedule

To be distributed

9. Assessment Tasks

Assignment	Content	Date	Value (%)
1. Professional engineering test *(individual)*	Addressing a contemporary professional engineering challenge	Tuesday Week 2	10*
2. Essay *(individual)*	Choice of topics, 1500 words	Tuesday Week 4	15
3. Presentation (group)	Brief presentation about the subject matter of the project	Tuesday/Thursday Week 7	15
4. Engineering article *(individual)*	Article suitable for Engineers Australia	Tuesday Week 10	15
5. Project performance (group)	Performance in competition	Tuesday/ Thursday Week 13	15
6. Project report (group)	Group report, including reflective component	Thursday Week 13	20
7. Attendance/ participation *(individual)*			10

* Compulsory to proceed

1. Professional engineering test

A 2 hour professional engineering assessment exercise, which assesses students' competency in responding to a substantial, non-routine, current professional engineering challenge against criteria of:

1. creativity – respond to a complex challenge
2. design – design an outline solution with adequate basic specification of key components
3. problem-solving – develop practical approaches to solving the problems identified
4. project management – develop an outline plan on how to manage the process
5. communication – write a press release.

2. Essay Report

The Essay report assignment is used as means of reinforcing the professional importance of all engineers in successfully communicating with their clients. In this case it is within the University setting with the marker as the 'client'.

It is called an essay report as in universities both forms of writing are legitimate forms of written communication. The essay is generally undertaken in continuous prose to present a coherent argument on a topic, while the report is a document divided into sections that seeks to cover a range of aspects of a topic. We have combined them to allow students to use sections and subheadings to highlight areas within their argument, and in so doing to practice both forms of writing.

The essay report should have:

- appropriate sections (introduction, main text/sections, conclusion),
- be formatted with titled sections, title page and table of contents
- be referenced within the text using the Harvard system (author, date. page no. for quotes) and a complete alphabetical by author reference list at the end
- sufficient level of detail to suit the topic and the word limit (within 10% of limit)

The essay report should also be written with the ENGG 1803 grade descriptors and the severe penalties for plagiarism in mind and be submitted on time.

Guidelines for Referencing

1. All material that you use or refer to **MUST** be cited, **both within the text where it is referred to**, and then a full reference should appear in the bibliography. This is true not only for quoted text, but also material you have paraphrased, figures you have copied etc.
2. Any text which is quoted should appear **in quotation marks with the citation immediately afterwards,** (for example "the heart is a four-chambered pump" (Smith and Johnson, 1996)). If more than a few words are being quoted, put the quote in its own paragraph, and indent it. It should not be necessary to quote more than an occasional sentence or two.
3. Any pictures, figures, or equations which you use in your report should have the source listed **in the caption,** or within the text immediately adjacent to the item.
4. The bibliography should contain a complete reference, which should allow the reader to locate the information referenced, right down to the page. The following list shows what must be included for each type of publication referenced.

Books

Full list of authors, year of publication, full title of book, editor's name (if relevant), publishers name, location of publication, number of pages in the whole book, page reference for citation (if a specific reference).

eg. Fung, Y.C., *Biomechanics: Mechanical Properties of Living Tissues*. 2nd ed. 1993, New York: Springer-Verlag 568 pages.

Book Chapters

Full list of authors for the chapter, year of publication, full title of chapter, title of the book, editor(s) name(s), publisher's name, location of publication, pages of chapter.
eg. Anderson, J.M., "Biocompatiblity of tissue engineered implants", in *Frontiers in Tissue Engineering*, Patrick, C.W., Mikos, A.G, and McIntire, L.V editors, Pergamon, New York, 1998, pages 166-196

Journal Article

Full list of authors, year of publication, full title of article, full journal name, volume number, issue number, page numbers of article.
eg. *Mow, V., et al., Biomechanics of diarthrodial joints: a review of twenty years of progress*. Journal of Biomechanical Engineering, 1993. **115(4B):** p**. 460-7**

Internet

Title of page, name of website, authors, and full URL to the exact page, Eg. Modeling of Occupant Biomechanics with Emphasis on the Analysis of Lower Extremity Injuries, Paul G. Bedewi and Nabih E. Bedewi, George Washington University website. http://www.ncac.gwu.edu/archives/papers/lower/lower.html , followed by date accessed

Other

(eg. Computer program manuals, etc)

Full list of authors, year, title of item, publisher, location of publication, page numbers. eg. ABAQUS *Theory Manual*, v5.3 1993, Pawtucket, RI: Hibbett, Karlsson, and Sorensen, Inc, p133-135. (Source: L. Bilston, 2001

3. Presentation

A short group presentation about your project, supported by appropriate visual aids, designed to assess cognitive, teamwork, time management and verbal communication skills. Further details will be distributed at appropriate times in class

4. Engineering article

Students will be required, individually, to prepare an article suitable for publication in Engineer's Australia (1000 words), following the journalistic requirements of the magazine, on a topic of their own selection about professional engineering. You are competing for space in a magazine. So flair in choice of topic and the way it is addressed and presented will be important.

5. Project

The project (varying with each cohort) will require students in their teams, to address a major challenge and to develop a competitive working design. It will require leadership, teamwork, problem solving, creativity, project management and design skills. Assessment is based on team performance in the competition. Further details will be distributed at appropriate times in class.

6. Project report

A group report describing the process used, the basis of the design, including a reflective component on the ways the team has operated and a dealt with challenges that arose. Further details will be distributed at appropriate times in class.

7. Participation/Attendance

Attendance at lectures and tutorials will be monitored by attendance sheets. However, attendance alone is not sufficient. Disruptive behaviour in lectures and non-active participation in tutorials will be penalised. If you are unable to attend a particular lecture or tutorial for good reasons, you should apply for 'Special Consideration' by completing a form available from the Faculty Office (or the Faculty website). For each unexplained absence/non-performance 3 marks will be deducted from your participation/attendance mark.

10. Submission of Assessment Tasks

Assessment tasks must be submitted by **4pm on the due date** through the secure mail-slot in Room 246, Link Building (ACIIC Office). **All assignments must include an assignment cover sheet** (individual or group as appropriate) **which includes an Academic Honesty declaration**. Copies are available from the Faculty or School websites.

Extensions will only be granted in exceptional personal circumstances, and must be approved by an ENGG1803 lecturer, in writing, prior to the deadline. The signed approval must be attached to late submissions. Assessment tasks submitted up to 24 hours late will incur a penalty of 10%, and those up to 48 hours late a penalty of 25%. Tasks submitted more than 48 hours late will receive an automatic zero fail mark.

11. Attendance

Lectures You are required to attend lectures as they provide an introduction to the key concepts and skills and signpost for students the tasks and learning requirements in other class activities and their own study. Attendance rolls will be regularly taken.

Tutorials These are built around group exercises which provide understanding and practical applications, and attendance is compulsory and will be monitored.

Group Project The success of group projects depends critically on commitment from all members of the team, as well as effective breakdown and delegation of tasks, planning and time management. Non-attendance and contribution penalises your fellow students. A peer assessment process will be used to identify different levels of contribution.

For all students, the university allows a maximum of 10% unexplained absence before exclusion from the class

12. Academic Honesty

The University of Sydney is committed to the highest standards of academic honesty. Our emphasis on academic honesty is designed to:

- ensure that students are rewarded for their own intellectual input
- educate students about the value of their own intellectual property and that of others
- inform students on the appropriate methods of using and building on the work of others via suitable methods of referencing/citations/acknowledgements
- aid students in the formation of their individual set of ethics.

The University is committed to the basic academic right that students receive due credit for work submitted for assessment. Integral to this is the notion that it is clearly unfair for students to submit work for assessment that dishonestly represents the work of others as their own. Such activity represents a form of fraud. The University has a responsibility to the community in general, and the engineering profession in particular, that graduating students have adequately displayed competency in the required areas.

Academic dishonesty, in the form of plagiarism, includes:

- Copying some or all of another student's assignment without acknowledgement
- Copying from textbooks or other copyrighted material without acknowledgement (ie trying to pass off other peoples' ideas as your own)

- Recycling reports from students from earlier years
- Fabrication of data
- Engaging another person to complete an assessment or examination
- Communicating with other students during an examination
- Bringing forbidden material into an examination
- Attempting to read another student's work during an examination
- Knowingly assisting another student in an act of academic dishonesty.

Depending on the nature of the dishonest behaviour penalties may vary from counseling and a note on your record, through to failure of a Unit of Study, and ultimately to exclusion from the University.

In Engineering it is common for students to work in groups to solve problems. This is perfectly acceptable and we encourage you to work together to help you understand course content. Unfortunately, this approach often leads to students submitting identical assignments, either in whole or in part, which is not acceptable. Any written assignment should be only your own work unless the course lecturer has informed you otherwise. In most circumstances, it is acceptable to discuss assignments with other students, compare completed assignments, methods and answers, or ask another student how to do a particular problem.

Written assignments and tutorial questions are designed to help your learning of important concepts. It is important to master the concepts in the early year courses as these form the basis for most of the more advanced engineering courses in later years. If you attempt to learn by following other student's assignments you will struggle with the course and with examinations. It is highly recommended that you never prepare/write your own assignments with the assignment of another student in front of you.

You should never let someone take your assignment away from you, or let them copy from you as this can be penalised as dishonest behaviour. Experience also suggests that you should be wary of letting another student submit an assignment on your behalf.

Some students are tempted to copy someone else's work due to either not fully understanding the concepts or because of other demands on their time. This is totally unacceptable, and will be heavily penalized.

If you are in doubt about acceptable or unacceptable practices, you should consult with the relevant staff member. Further details of the University's Academic Honesty policy and the responsibilities of staff and students can be found at http://db.usyd.edu.au/policy/policy_index.stm.