To: All students conducting research

All study leaders

All post graduate programme co-ordinators

Faculty of Engineering

From: Faculty Research Ethics Committee

31 March 2013

Ethics guideline for postgraduate students in the Faculty of Engineering

1   Background

The Higher Degrees Committee of the institution requires that the institution's ethics policy is adhered to for all research undertaken within the institution. The engineering profession also has very specific ethical standards that should be incorporated into a comprehensive framework for the Faculty. This document gives a combined view of good conduct for both the profession and academic research.

2   Scope of this document

This document serves as a guideline for the application of research and engineering ethics as practiced at the Faculty of Engineering.

3   Target audience

The following parties have been identified as the target audience for this document and have very specific roles and responsibilities in the practice and execution of ethical research in the engineering disciplines:

- The office of the Dean;
- Faculty management;
- Heads of Departments;

- Research programme leaders;
- Research supervisors;
- Industry partners; and
- Research students.

4   Preamble

The Faculty of Engineering, along with many other bodies engaged in research in South Africa and more widely, has become increasingly aware of the importance and relevance of well defined and properly supported codes, protocols and standards to govern the ethics of research in various spheres of society.

Research ethics involves the application of fundamental ethical principles to a variety of topics involving scientific research. These include the design and implementation of research involving society, various aspects of academic scandal, including scientific misconduct (such as fraud, fabrication of data and plagiarism), whistle blowing and regulation of research. A research institution is built on a foundation of trust. Researchers trust that the results reported by others are valid. Society trusts that the results of research reflect an honest attempt by researchers to describe the world accurately and without bias. But this trust will endure only if the research community devotes itself to exemplifying and transmitting the values associated with ethical scientific conduct.

This document outlines the following:

- It explains the fundamental principles of research ethics.
- It explains the various elements of research ethics including research design, publications, whistle blowing and engineering ethics.
- It provides guidelines for ethical conduct in all of the phases of the research process.
- It provides a structure to ensure ethical compliance for all research in the faculty.

5   Fundamental ethics principles

Research ethics provides guidelines for the responsible conduct of engineering research. In addition, research ethics educates and monitors researchers to ensure a high ethical standard.

The origins of research ethics are in medicine. The first documented code of ethics was compiled after the Nuremberg trials (when Nazi doctors were accused of conducting research on subjects who did not volunteer to participate). In order to prevent this in future, the following principles were adopted as cited by Gregory (2003:48):

- Research participants must voluntarily consent to research participation.
- Research aims should contribute to the good of society.
- Research must be based on sound theory.
- Research must avoid unnecessary suffering.
- No research projects can go forward where serious injuries are potential outcomes.
- The degree of risk taken with research participants cannot exceed anticipated benefits of results.
- Proper environment and protection for participants is necessary.
- Experiments can be conducted only by scientifically qualified persons.
- Human subjects must be allowed to discontinue their participation at any time.
- Scientists must be prepared to terminate the experiment if there is cause to believe that continuation will be harmful or result in injury or death.

The following fundamental principles are pursued in modern research ethics, cited by Gregory (2003):

- ***Integrity and quality.***
- ***Fully informed researchers and participants.***
- ***Confidentiality and anonymity.***
- ***Voluntary participation, free from coercion.***
- ***Avoiding harm to participants and the environment.***
- ***Independence and impartiality of the researchers.***

6   The research process

6.1   Research topic

A number of seemingly simple, but fundamental questions arise when embarking on a research study (Bell, 2005):

- Are the research questions worth asking? Why?
- Have they already been answered? In other words, has research on this topic been reviewed carefully?
- In whose interest are the questions being asked?
- How well do the research methods fit the aims of the research? Are they the best way of answering the research questions?
- How could the research findings be used or interpreted by other people?

At first sight, these appear to be questions of quality or methodology, rather than being about research ethics. Certainly, they are questions that a beneficiary would ask when reviewing a research proposal, and so they are always a good starting point in planning the proposed research.

But these questions are rooted in wider ethical considerations, about whether the research is worth doing and how it might be used or misused. Research can waste time (and money and other things) - not least for the people who take part in it - or it can produce wrong or misleading answers, which in turn could cause harm in their dissemination or application.

6.2   Research proposal

There are fundamental ethical questions that should be asked about the proposed research when compiling a research proposal (Bell, 2005). These questions are:

- *Research should be designed, reviewed and undertaken to ensure integrity and quality.*
  Is the research study worth doing? Can the integrity and quality of the research be ensured?
- *Research staff and subjects must be informed fully about the purpose, methods and intended possible uses of the research, what their participation in the research entails and what risks, if any, are involved.*
  Can potential participants be fully informed of the purpose, methods and intended possible uses of the research? If not, are you sure you can convince an ethics committee that your project is justifiable?
- *The **confidentiality** of information supplied by research subjects and the **anonymity** of respondents must be respected.*
  Is it possible to maintain participant confidentiality and anonymity within the study?
- *Research participants must participate in a voluntary way, free from any coercion.*
  Can it be guaranteed that participants' involvement in the research is truly voluntary?
- *Harm to research participants must be avoided.*
  Can the researcher guarantee the absence of harm to the research participants including reputational damage?
  The independence of research must be clear, and any conflicts of interest or partiality must be explicit.
  Will the research design enable the researchers to remain independent throughout the process? Are there any conflicts of interest?

6.3   Funding requirements

Funders' requirements generally relate to two concerns:

- Any potential funding source should include a statement about the ethics considerations posed by the research and how those will be addressed. Peer reviewers and referees are nearly always asked by funders to comment specifically on the ethics of the proposed study.
- Second, most funders now have specific requirements about ethics approval and a proposal should state what ethics approval will be needed and how you it will be obtained.

6.4 Ethics statement

The following matters should be addressed by the ethics statement (Oliver, 2010):

- How quality and integrity will be ensured;
- how informed consent will be obtained from participants;
- how the confidentiality and anonymity of the research respondents will be ensured ;
- how voluntary participation will be ensured;
- how harm to the participants will be prevented;
- how harm to the environment will be prevented; and
- how it is ensured that research will be independent and impartial.

The faculty ethics committee needs to make sure that researchers demonstrate that they have given proper, careful consideration to ethics questions. Preferably, peer reviewers should be asked to comment on the ethics of the proposed research.

6.5 Risk assessment

It is suggested that one should consider various scenarios – by taking time to try and anticipate the unintended consequences of the research (Oliver 2010). This depends very much on the topic being researched, but one should consider what to do if the research accidentally causes distress to research respondents. In engineering one has to consider the risk associated with conducting research tasks in a laboratory or in the field.

Most institutions now require that research projects have formal 'risk assessments' carried out before a project officially starts. At the stage of preparing a proposal, it is suggested that institutional requirements are met. Some funders, such as government departments, also require risk assessments to be included with proposals.

6.6 Research design

This section highlights the ethics questions involved in research design, in relation to different methodological approaches, and different stages in the process. It aims to be a useful guide to ethics in research design at all stages of a study, but especially at the first stages of designing a new study. The sections below are suggested as a prompt for the ethics considerations to be addressed (Bell, 2005).

- Sampling.

- Consent.
- Confidentiality.
- Research method.
- Permission and approval.

Research often depends on gaining access to either people or data. That means the researcher needs the cooperation of the 'gatekeepers' to the required data you want to access, or to the people. In practice, permission or approval from different organisations or bodies are required before the research can proceed. As governance arrangements for research have become more common, formal permission is increasingly likely to be required in order to conduct your study. Most commonly, this concerns ethics approval. Almost all research now requires approval from an ethics committee. There are two key points here:

- First, the researcher needs to establish what research governance requirements apply to the research, and go through those processes.
- Second, it is important to recognize and to accept that negotiating these requirements can take some time. It is possible to speed up the process by making sure the research proposal is well prepared, but some forms of approval may be time consuming.

6.7   Faculty Research Ethics Committee (REC)

Ethics committee approval is not simply a 'pass' or 'fail'. It is a formative, not a punitive assessment of the application. One may obtain a straightforward approval and can probably increase the likelihood of that happening if time is spent on the application (Eckstein, 2003 and Bell, 2005:46).

In practice, however, it is very common for committees to make some recommendations, or to set some requirements for things they want to be addressed before they will issue approval.

A kind of peer review?

In thinking about ethics committee feedback, a useful parallel is the response obtained from a peer review when an article is submitted to a journal – only rarely is an article accepted without any revisions; equally, it is unusual for a journal submission to be rejected outright, with no opportunity to respond. Ethics review is also a form of peer review.

Don't panic, and don't get angry

The letter from the ethics committee may start by saying 'the committee has been unable to approve your application' – and this inevitably feels alarming and frustrating, especially if the researcher spent a long time preparing an application. If the application has not been approved, or is approved subject to

requirements, the letter should then go on to give reasons for that decision, and those reasons will include recommendations or requirements for things the ethics committee wants addressed.

6.8   Conducting the research

This section provides information about ethical considerations during the research itself as proposed by Bell (2005).

Reporting and dissemination

Ethical and regulatory issues do not finish once the data collection is completed. Once data has been collected, there will be a number of obligations to fulfill. The researcher has a responsibility to produce certain outputs, including responsibilities concerning the way in which data is portrayed and interpreted.

Research ethics refers to the moral principles guiding research, from its inception through to completion and publication of results and beyond'. Ethics principles still apply when the researcher is writing up the research.

7   Research publications

7.1   Key issues

In terms of research publications, there are a number of key issues to be considered (Whitbeck, 2011:327):

Honesty. Honesty and integrity is a duty of each author and person, expert-reviewer and member of journal editorial boards.

Review process. The peer-review process contributes to the quality control and it is an essential step to ascertain the standing and originality of the research.

Ethical standards. Recent journal editorials presented some experience of unscrupulous activities. *Plagiarism.* All research publications must be submitted to Turnitin software in order to verify the authenticity of the work that has been submitted.

Plagiarism is defined as the theft of somebody else's ideas, thoughts, pictures, theories, words, or stories as one's own. If researchers plagiarise the work of others, they are bringing into question the

integrity, ethics, and trustworthiness of the sum total of his or her research. In addition, plagiarism is both an illegal act and punishable, considered to be on the same level as stealing from the author that which was originally created (Whitbeck, 2011:345).

Plagiarism takes many forms. On one end of the spectrum are people who intentionally take a passage word-for-word, put it in their own work, and do not properly credit the original author. The other end consists of unintentional (or simply lazy) paraphrased and fragmented texts the author has pieced together from several works without properly citing the original sources. No part of the spectrum of potential plagiaristic acts is tolerated by the scientific community, and research manuscripts will be rejected by publishers if they contain any form of plagiarism – including unintentional plagiarism.

Authorship.

Who may claim a right to authorship? In which order should the authors be listed?

7.2   Guiding principles for authorship

Authorship is *substantial* participation in a publication. Substantial participation shall mean:

- conception and design of the project; or
- analysis *and* interpretation of data; and
- drafting or revising the article critically for important intellectual content; and
- final approval of the version to be published (Whitbeck, 2011:334).

Where substantial contributions (as defined above) are made by several persons to a common project, they will be *joint authors of the product*. Each author should have participated sufficiently in the work to take responsibility for appropriate portions of the content. One or more authors should take responsibility for the integrity of the work from inception to published article.

Authors should be able to provide a description of what each contributed. All others who contributed to the work who are not authors should be named in the *Acknowledgements*, and what they did should be described.

Order of author names on a jointly authored document

- Different levels of contribution: The person who has made the greatest contribution to the paper (often the project leader) is to be listed first with the remaining authors listed in order of their contribution.
- The same level of contribution: Normally the person who led the production of the document is listed first. Remaining authors will be listed alphabetically. Where there is no principal author, all names are to be listed alphabetically, and where all authors are regarded as having made an equivalent contribution, this should be noted in the author credits.

Authorship agreement

Authorship is a matter that should be discussed between study leaders and students at an early stage in a project, and reviewed whenever there are changes in participation. The study leader must initiate this discussion. The agreement may be altered by mutual agreement during the course of the project.

Student-staff-supervisor co-publication

The conditions listed above apply in the first instance. In the case of a co-authored publication by a student and her/his research supervisor that is substantially based on the student's dissertation or thesis the student will normally be the first author. This condition may be waived if the student plays little or no role in the preparation of the work for publication. In such an instance, the student will be the second author.

Exclusions

- Participation solely in the acquisition of funding or the collection of data does not justify authorship.
- General supervision or leadership of a research group is not by itself sufficient for authorship.
- Mere possession of an institutional position, such as Department Chair, does not justify authorship credit. Minor contributions to the research or to the writing for publications are appropriately acknowledged.

Acknowledgements of contribution to a research project

It is good practice to acknowledge those who contribute to a publication. An inclusive principle of acknowledgement should be followed as far as possible. The significance of the contribution of those who are acknowledged should be signaled.

Disputes

Disputes concerning any aspects of authorship described above should in the first instance be resolved between the researchers concerned. Where this is not possible, the Head of the Department or research centre within which the principal researcher or student is based is responsible for arbitration. If this mechanism fails and the Departmental Research Ethics Committee is also unable to resolve the dispute, the matter may be referred to a Faculty Research Ethics Committee for final arbitration.

8   Conflicts of interest

8.1   Key issues

Conflicts of interest arise when a person's (or an organisation's) obligations to a particular research project conflict with their personal interests or obligations. For example, a university researcher who owns stock in a company is obligated to report truthful and accurate data, but he might be conflicted if faced with data that would hurt stock prices for Company XYZ.

A researcher should attempt to identify potential conflicts of interest in order to confront those issues before they have a chance to do harm or damage (Whitbeck, 2011).

8.2   Guiding principles

- Disclose to the institution any major or significant financial conflicts of interest that might interfere with their ability to conduct a research project objectively.
- Disclose any such financial conflicts of interest of their spouses or dependent children.
- Provide a solution beforehand for dealing with these conflicts.

9   Whistle blowing

9.1   Key issues

A basic ethical dilemma is that researchers have the duty to report to the appropriate authority a possible risk to others or any other form of unethical conduct from any party observed in the research. According to first principles, this duty overrides the duty to deliver the required results. Researchers may be disciplined, or have their projects terminated, even if the failure to report such a risk does not have significant consequences (Elliot and Stern, 1997:167).

9.2   Guiding principles

There are several potential whistle blowing issues that researchers may face. Some have to do with technical practices but many others have to do with broader conduct. These include:

- Relationships between researchers, industry and other parties.
- Ensuring legal compliance by researchers, industry and other parties.
- Irregularities in examining the research results.
- Conflict of interest.
- Bribery and kickbacks.
- Treatment of confidential or proprietary information.
- Outside employment/activities.
- Unethical business conduct.

10   Engineering specific ethics

10.1   Key issues

As engineering developed as a distinct profession, engineers and technologists saw themselves as either independent professional practitioners or technical employees of large enterprises. This growing professionalism gave rise to the development of various engineering societies. Even so, at that time ethics was viewed as a personal rather than a broad professional concern. A number of technical disasters have, over the years, had a profound effect on engineers and technologists and forced the profession to confront shortcomings in technical and construction practice, as well as ethical standards (Whitbeck, 2011).

One response was the development of formal codes of ethics by engineering societies. Also, concerns for professional practice and protecting the public highlighted by technical failures require formal credentials as a requirement to practice. This involves meeting some combination of educational, experience, and testing requirements.

10.2   Guiding principles

Codes of engineering ethics identify a specific precedence with respect to the engineer's consideration for the public, clients, employers, and the profession.

The Engineering Council of South Africa (ECSA) and the various professional societies have prepared codes of ethics. These have been incorporated to a greater or lesser degree into regulatory laws. While these statements of general principles serve as a guide, engineers and technologists still require sound judgment to interpret how the code would apply to specific circumstances.

The following principles are proposed by ECSA:

- Engineers and technologists shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.
- Engineers and technologists shall perform services only in areas of their competence.
- Engineers and technologists shall issue public statements only in an objective and truthful manner.
- Engineers and technologists shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
- Engineers and technologists shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

- Engineers and technologists shall act in such a manner as to uphold and enhance the honour, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
- Engineers and technologists shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers and technologists under their supervision.

11   References

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11.7   ECSA