Towards the Attainment of the Student / Program Outcome on Ethical and Professional Responsibility

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Abstract–**This paper describes the current review and revision of some Accreditation Board for Engineering and Technology (ABET) criteria, in particular, the student outcome on ethical and professional responsibility. The proposaed changes on the said outcome have raised deep concern in the American Society for Engineering Education (ASEE) Liberal Education/Engineering and Society Division. The ABET statement of the outcome which is "to develop the ability of the student to understand ethical and professional responsibility" is merely adopted as one of the program/student outcomes of the Commission on Higher Education (CHED) and the Philippine Technological Council Accreditation Commission Board for Engineering and Technology (PTC-ACBET). Based on the observations/findings of the authors, most institutions which have shifted from input-based into outcomes-based education (OBE) in their engineering programs need a model syllabus for courses where the topic engineering ethics or professional ethics is embedded. Hence, the authors present as the course syllabus that they use in teaching the topics in engineering ethics which are integrated in the course required by CHED for engineering programs with board examination "Engineering Law, Contracts and Ethics." The authors share as well some teaching and learning activities and assessment tools which they use in the course and find effective.**

Keywords–**Outcomes-based education, student or program outcome, ethical and professional responsibility**

I. INTRODUCTION

One of the challenges of globalization brought about by ASEAN integration is full compliance with international standards and quality of engineering education which will pave the way to reciprocity of professional engineering qualifications. To achieve this, higher education institutions (HEIS) have to subject their engineering programs to international accreditation by a local accrediting body or international accrediting body recognized by Washington Accord. In the Philippines, the Philippine Technological Council Accreditation Commission Board for Engineering and Technology (PTC-ACBET) serves as the local accrediting body, while the Accreditation Board for Engineering and Technology (ABET) is an international accrediting body which accredits engineering programs in the United States territory and outside it. Both accrediting bodies subscribe to outcomes-based education system (OBE) whichmeans clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences [1].Outcomes are clear learning results such as knowledge, skills, values, behavior that learners have to demonstrate at the end of significant learning experiences. Two Philippine HEIs the Mapua Institute of Technology and Technological Institute of the Philippines have obtained both ABET accreditation and PTC-ACBET accreditation of their engineering programs. Such a move to obtain international accreditation was followed by other HEIs in the Philippines and in some parts of Asia. The process is tedious and requires first a shift from input-based to outcomes-based system of education which is mandated by the Commission on Higher Education (CHED). It entails the formulation of the program educational objectives (PEO), adoption of the student outcomes (SO) or program outcomes (POs) stipulated by ABET, CHED, or PTC-ACBET, curriculum mopping and design of the continuous quality improvement framework. While most of the SOs or POs are relatively easy to attain in the course or courses assigned to them, the one on ethical and professional responsibility is a little bit problematic since such is not in the realm of the engineer's expertise. Such observations and findings are based on the authors' evaluation of the OBE implementation of CHED Center of Excellence/ Center of Development (COE/COD) applicants. Thus, this paper focuses on the attainment of the SO or PO on ethical and professional responsibility.

II. ETHICS OUTCOME

Based on ABET, CHED, and PTC-ACBET list of program outcomes or student outcomes, the outcome or ethical and professional responsibility is listed as outcome "f" and stated as follows:An understanding of professional and ethical responsibility. Based on the statement or articulation of this ethics outcome, the following observations are hereby presented:

1. This is one of the few outcomes that does not start with "An ability to "
2. The outcome uses the noun "understanding" which is not easy to measure and the verb "to understand" is at the lower order of thinking skills of Bloom's taxonomy.
3. The outcome does not contextualize the professional and ethical responsibility.

Thus, there is a need to revise the statement of the outcome. The American Society for Engineering Education (ASEE) Liberal Education/Engineering and Society Division is deeply concerned about the proposed change in this outcome that runs counter to the long standing consensus recognized in the Washington Accord, that engineer must be able to practice professional responsibility.

Thus, ASEE urges ABET to: Retain the concept of "professional responsibility" in the ethics outcome, or at a

minimum change the proposed wording to "Demonstrate an understanding of ethical principles and professional and social responsibility in the context of engineering practice." It is not enough merely for engineers to "demonstrate ethical principles." Engineers must possess a reflective ability to assess a given situation and apply ethical analytical frameworks, as well as professional codes to that situation. We would also like to see the criteria explicitly including the ability to generate creative responses to ethical challenges engineers encounter in professional practice [2]

While professional responsibility and ethical or moral responsibility are closely related to each other, a closer look at them yields some differences. The following definitions show such differences:

Responsibility - A requirement to secure good outcome in the matter of which one is responsible; often, this is some aspect of another's welfare. Moral responsibilities are derived from one's relationship to the person whose welfare is in question or the special knowledge (such as professional knowledge) that the person with responsibility possesses what is crucial to that person's well-being. Characteristically, the achievement of the desires outcome involves some exercise of discretion or judgment [3].

Professional Responsibility - A paradigm case of the moral responsibility that arises from the special knowledge that one possesses. It is mastery of a special body of advance knowledge, particularly knowledge which bears directly on the well-being of others that demarcates a profession. It is as custodians of special knowledge which bears on human well-being that professionals held to be constrained by special moral responsibilities, that is, moral requirements to apply their knowledge in ways that benefit the rest of society [3].

If the above proposal of ASEE is to be adopted by ABET such as: Demonstrate an understanding of ethical principles and professional and social responsibility in the context of engineering practice, the following performance indicators may be considered:

1. Identify ethical issues and concerns in engineering practice.
2. Differentiate ethical and professional and social responsibilities of engineers.
3. Explain the ethical principles which are relevant to engineering practice.
4. Apply the ethical principles embodied in the Engineer's Code of Ethics to specific situations / scenarios in engineering practice.

It is worth considering the following goals of ethics teaching in higher education based on Hasting Ethics Center Study [4]. (Please see figure 1)

1. Stimulate the ethical imagination. Students are challenged to think and realize that situations they may encounter in the practice of their profession are not only technical or managerial problems but also ethical problems.
2. Recognize ethical issues. It is not enough for students to see the complexity of a situation which involves ethical issues. Students must be able to identify not only the obvious ones but also those embedded in the complex situation.
3. Develop analytical skills. Students of engineering have well – developed analytical skills. What they can do is to apply those analytical skills in analyzing ethical issues which might be ambiguous or complex.
4. Elicit a sense of responsibility. This is a real challenge to the teacher. While the teacher is not supposed to impose her set of values to the students, she must be skillful enough to stimulate a sense of responsibility among her students, to move them to see themselves as moral agents and to serve as a catalyst in the character formation of her students.
5. Tolerate disagreement and ambiguity. This may be frustrating to engineering students who are accustomed to arriving at a definite answer in solving engineering problems. Students must be made to understand that solving complex ethical problems is a real challenge which entails disagreement and ambiguity. Codes of ethics may prove to be inadequate to bring about agreement. However to persevere in working out an agreement is a mark of having a sense of responsibility.

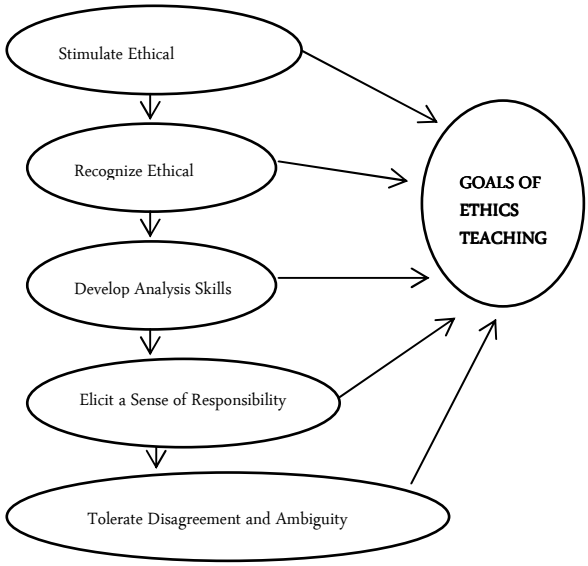

Fig. 1 Goals of Ethics in Higher Education
(Harris, et. al, 1995)

III. COURSE LEARNING OUTCOMES AND LEARNING ACTIVITIES

Based on the CHED prescribed curriculum for engineering programs, some courses upon which ethics topics could be embedded are Engineering Laws, Contracts and Ethics, Methods of Research and Safety Engineering. However, most programs choose the first one where to integrate ethics and, therefore attain the entire ethics outcome. The succeeding discussion describes the identified course, state the learning outcomes for the topics on ethics and some teaching and learning activities.
Learning Outcomes(LOs) are statements that tell us what the students should be able to know and do if they were able to acquire the knowledge and skills that they are supposed to learn from the course. These statements should be specific,

measurable, attainable, realistic and time – bound. LOs are clearly stated and aligned with the student outcomes.

For the course Engineering Ethics, five LOs were formulated which are aligned with the program outcomes. These LOs are the following: A student completing the course should at the minimum be able to [5]:

1. Resolve ethical dilemmas in the mechanical engineering profession by applying ethical theories and concepts, and ethical problem solving techniques.
2. Apply the PSME Code of Ethics to case studies in engineering ethics.

The learning outcomes cover the learning of the student in various topics such the Mechanical Engineering profession, the Mechanical Engineering law, the local and international codes and standards, contracts and specifications and Engineering Ethics as well as the ethical issues in engineering.

After the LOs are formulated, one should select the teaching methods or learning activities (LAs) that will be utilized to conduct the class. These activities must be aligned with the LOs for the course. For this particular course, the following LAs will be utilized for the delivery of the topics in the course: lecture, oral reports, class discussion, debate, mini ethics bowl and role playing in video. Through these various LAs, the students will be able to understand the concepts of engineering ethics, apply these to the various case studies that will be discussed in class and hopefully develop a sense of professional and ethical responsibility. Three of the LAs previously mentioned – ethics bowl, role playing and debate are discussed below:

A.The Ethics Bowl

The Intercollegiate Ethics Bowl (IEB) was developed in 1993 by Dr. Robert Ladenson. The competition, which at the start was only held at the Illinois Institute of Technology for two years, grew into what is now a nationwide event that in the United States. Due to the increase in the number of Educational Institutions that wish to join the competition, regional competitions were held where only the top teams were eligible to participate in the national competition.

With the permission of Dr. Ladenson, the IEB was introduced in the Philippines in 2003 by one of the authors, Dr. Belino,asaninterdepartmental competition within the College of Engineering of the De La Salle University- Manila. Since then, the IEB has become an inter-university competition and is now attended by representatives from at least 12 schools from the South Manila Inter-Institutional Consortium [6].

The event has attracted increased participation partly due to the many educational benefits it may offer and provide. Since only a limited pool of students may participate in the official Ethics Bowl events, the classroom could be a venue for holding such an event to allow more students to participate in the competition, maximizing the educational benefits of the IEB.

The Ethics Bowl is an event that provides the opportunity for participants to be involved in both a rich educational experience and an exciting team-based competition [7]. Shown below is a list of the benefits that students may derive from the activity, as was further noted by Dr. Ladenson:

- Develops both intellectual and well-organized manner of thinking in tackling ethical issues.
- Provides valuable background information regarding ethical issues that may be relevant to their individual interests, concerns and career aspirations.
- Strengthens the understanding of ethics over a wide array of important issues.

The Ethics Bowl assigned as a learning activity in class has been implemented with varying methodologies by several Schools. Many of such Schools who have done so have reported the many benefits experienced by students and instructors. In a classroom setting, based on the experience of Cruz et al., the Ethics Bowl may provide benefits to students in the following areas: communication skills, organization of thoughts, argument formulation, clarity in oral presentation of opinion, teamwork and moral autonomy and ethical thinking [8].

The benefits provided by the implementation of the Ethics Bowl in class also coincide with the expectations from Outcomes-Based Education (OBE). In OBE, students are expected to know and/or perform various relevant skills, knowledge and behavior by the time of graduation.

One of the requirements of the course ME Laws, Ethics, Codes and Standards at DLSU is the conduct of a mini – ethics bowl in class. The students are divided into several groups with a maximum of four members in a group. Each group is provided with a compilation of at least 20 case studies for them to read and analyze. The groups have to identify the ethical issues involved in each of the cases and be able to defend in class how they are going to resolve such issues. The cases included several ethical concerns such as conflict of interest, bribery and extortion, environmental ethics, research and mentoring, authorship, intellectual property, public safety and professional responsibility.

On the day of the event, a representative from each group draws lots to determine the sequence of presentation. The first group picks up a case from a bowl containing 20 cases, after which the case selected is read aloud. The group then is given five minutes to confer with each other and another ten minutes to present their analysis of the case. After the presentation, the other students and the judges will ask questions with regard to the analysis presented by the group. The same procedures are repeated for other groups.

The criteria used for judging are as follows:

a. Clarity and Intelligibility (25%) – It tells us whether the students were able to state and defend their position in a way that it is logically consistent and that the judges were able to understand the team's line of reasoning clearly.
b. Depth and Substance (25%) – It tells us whether the team had identified and discussed the factors that are considered by the judges as ethically relevant in relation to the case.
c. Ethical Relevance (25%) – It tells us whether the team had stayed on track by avoiding preoccupation with issues that are considered ethically irrelevant by the judges.
d. Deliberative Thoughtfulness (25%) - It tells us whether the team's presentation of its position with regard to the case indicates both awareness and thoughtful consideration of different

viewpoints, including those of individuals who may disagree with their analysis.

The groups that get the highest scores will be announced winners in the mini – ethics bowl competition.

As part of the Continuous Quality Improvement Efforts of School of Mechanical Engineering of Mapua Institute of Technology, constant fine tuning have been done to continuously improve its various course offerings, including its course on engineering ethics. The Ethics Bowl was implemented in the past as part of the requirements for the course, and is planned to be reinstalled in the succeeding academic quarters.

At some point during the term after the lectures on engineering ethics have been given, special activities are provided to students. One of such activities is the intra-class Ethics Bowl. A few days before the activity, important information (e.g. the rationale, rules and the grading scheme) are provided. Students are assigned to random groups to reflect real life situations when individuals at times do not have the liberty to choose the people they work with. The class is usually divided into three to four groups, each composed of at least five members. The grading system utilized is very similar to that shown in the previous section, and also based on the tools used in the annual Inter-School Ethics Bowl in the Philippines.

For the conduct of the activity, the groups would randomly pick a number which represents the case number to be assigned to them. The cases would be flashed in front of the class and will be assigned to the different groups. All groups would then be given fifteen minutes to deliberate and resolve the moral dilemma presented, utilizing various principles covered in the course. A member is assigned as a secretary of the group and is in-charge of noting key points in the group's deliberation and position. After the given time has expired, the first group will be given five minutes to present their view on the case. The non – presenting groups are given ample time to critic and question the presenting group's response, while the presenting group is given an opportunity to provide rebuttals to questions posed by other groups and the judges. The next group would then be given the chance to give their response after the first group has completed the round. The process would then be repeated until all groups have given their responses and rebuttals.

In the conduct of the mini–ethics bowl in the classroom, several observations have been noted by the faculty members handling the course. It was noted that the students were able to strengthen their values of teamwork and cooperation, since the activity demands that each student contribute and participate to ensure a much effective response and resolution of the cases provided. The students have also been exposed to several case studies involving one or more ethical issues, on top of what is provided to them during examinations and lectures. This exposure to ethical problem solving requires the process of analysis, and thus developed their intellectual capabilities, deepened their ethical understanding and strengthened their commitment to ethical concerns.

During the presentation, students were able to develop their confidence and reasoning abilities as they defended their position orally. It also made the students realize that in some way, their position may not always be the most ethical way of resolving the issues. The Ethics Bowl was a good learning experience, considering that everyone participated and interacted with each other during the entire activity.

Students mostly were both excited and nervous during the competition since they felt the pressure of the contest, but were also feeling the "rush" brought about by the competitive nature of the activity. Students felt less shy while presenting their arguments orally, since most of the participants have known each other due to being together for several years in their undergraduate education. It was also observed that students who usually are reluctant to participate and express themselves in class often become active and interactive during the activity.

There are, however, challenges in implementing the activity in a classroom environment. One consideration is the additional demand on instructors in terms of providing new cases to constantly expand the database, so as to limit recycling of questions during the succeeding academic terms. Time restriction brought about by the limited time to cover the prescribed topics within the course proves to be a consideration as well. The time allotment for every meeting of the class, which ranges from one to one and a half hours, may also be a factor that could negatively impact the activity. In such cases, modified schedules may be done to augment class schedule limitations.

B. Role Play in Video Form

Students are grouped with a maximum of five members and are tasked to come up with a video incorporating various ethical issues in engineering. In this activity students are the actors and scriptwriters. They present various ethical issues, analyze them and give proposed solutions. These videos are shown in class and the other students are asked to critique and evaluate the said outputs. The videos are evaluated based on three different criteria namely (1) identification of main issues; (2) analysis of the issues; and, (3) proposed solution to the issues presented.

In this activity, students learn the values of cooperation and teamwork as well as being able to understand professional and ethical responsibility. The students are also able to enjoy the activity and they have given their best in the field of acting and creativity.

C. The Debate

In one of the sessions in the Engineering Ethics class, students are required to participate in a debate activity. The class is divided into two, one group to consider the issue to be ethical and the other group to consider the issue to be unethical. One example of the issue being debated upon is that of gift – giving in a corporate scenario. The students find this activity exciting and challenging. Everybody was able to participate and contribute to the goals set by each group. The value of leadership, team work and cooperation was highlighted in this activity. The students who are quiet in class became so participative during the debate.

IV. THE ASSESSMENT, REFERNCES AND POLICIES

The assessment methods for the course will then be determined and these should be aligned with the LOs. These should evaluate student progress and should serve as a measure if the desired LOs were achieved. In this course the following will be used to assess the student's performance: midterm and

final exams, mini – ethics bowl, term project (video), and class participation. An example grading system and rubric for the mini – ethics bowl and the term project is found in Appendix 1. This rubric will tell the students how their works will be graded by their professors. The grading system in terms of percentage for every requirement is also included in the syllabus.

The list of reference materials used in the conduct of the course should be copyrighted within the last five years. On – line resources must also be included to supplement the theories learned by the students in class.

Another important aspect of an outcomes – based syllabus is that it should include the class policies which may be derived from the student handbooks and other sources. These policies will make it easy for the students to know what to do, for example, in case that he was not able to take the midterm or final exam due to uncontrolled circumstances.

V. EVALUATION OF PROGRAM / STUDENT OUTCOMES

It is important to note that different assessments of performance are done within a course. Student performance for a course, based on several factors (e.g. quantitative test items, grammar and proper effective composition for essays, project quality and content, etc.), tends to be represented by a standard grade point at the end of the course. The grade point of the student is usually a converted numerical value, taken from the student's final grade- a summation which is computed from scores from different class activities of varying weights. Due to the many and high variability of inputs that make up the final grade, it is strongly advised not to use aggregated scores to represent the degree of attainment of student outcomes.

Assessment tools should be planned and chosen properly in order to reflect the student's attainment of the outcome. A tool or a set of tools must be developed to make sure that educators accurately gather data that could be used to determine the extent to which the outcomes have been attained. These tools may be in the form of LAs that are utilized for the course.

For the syllabus developed by the authors, three assessment tools were assigned to measure outcomes attainment, each tool to be utilized for each LO. One relevant LA was also selected to assess each of the LOs for the course. These selected LAs include the mini-ethics bowl and relevant portions of both the midterm and final examinations, representing the three LOs identified.

The assessment tools should be able to measure the LO attainment. An example of this would be to create an assessment system to measure the degree to which a student can resolve a moral dilemma during the mini-ethics bowl using techniques and concepts discussed in class. The result of the assessment could be numerical or alphabetical, and may also be used for student performance scoring for the final grade. The data resulting from the assessment must not be aggregated, taking note of the attainment scores obtained by each student for each LO. The data collected may now be used for evaluation of the degree of attainment of the program outcome.

IV CONCLUSION

Various factors have driven the push towards implementing outcomes-based education in the Philippines, which include global trends on education, various literature on outcomes-based teaching and learning and the CHED's initiatives. In combination with the global need for much more effective teaching and learning models for engineering ethics, the curriculum and syllabi of courses that provide opportunity for the students' development of ethical autonomy should be reconsidered. Outcomes-based education provides the structure for engineering schools to realistically evaluate the level at which expected outcomes have been attained by their respective programs.

One of the critical points for an effective outcomes-based ethics course would be the development of a comprehensive syllabus, which reflects specifically what outcomes are expected to be attained by the students at the end of the course and program. The development of such a syllabus would also help instructors focus more on LAs and LOs that are more relevant and effective in terms of the attainment of the program outcomes. The paper provides a guide for concerned engineering programs in their own efforts of continually striving towards improved teaching and learning of engineering ethics. In the end, the beneficiaries of such push towards an effective outcomes-based education, particularly in engineering ethics, will be the students, the various educational institutions, the different professions and the nation.

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Appendix 1- Sample Course Syllabus

Course Title: ME Laws, Ethics, Codes and Standards
Credit Units: 3 units
Pre – requisites: None
Course description: The course deals with the study of the Mechanical Engineering law, code of ethics, ethical theories, and ethical issues in the practice of engineering. Familiarization with the technical codes and standards are included.

LEARNING OUTCOMES (LO):
On completion of the course, the student is expected to be able to do the following:

Expected Graduate Attributes	STUDENT OUTCOMES	LEARNING OUTCOMES
Critical and creative thinker Effective communicator Service – driven citizen	PO-F: An understanding of professional and ethical responsibility PO - H. An understanding of the impact of engineering solutions in a global and societal context PO-J. An awareness of the contemporary issues	LO1: Explain the field of mechanical engineering and its applications. LO2: Explain engineering profession and the requirements for professional practice LO3: Resolve ethical dilemmas in the mechanical engineering profession with the use of ethical theories and concepts, and ethical problem solving techniques. LO4: Apply the PSME code of Ethics to case studies in engineering ethics LO5: Remember important and critical provisions of the Mechanical Engineering Law. LO6: Remember the concepts and the nature of contracts.

Course Assessment Matrix

	Student Outcomes										
Learning Outcomes	A	B	C	D	E	F	G	H	I	J	K
LO1								2			
LO2								2			
LO3						3				2	
LO4						3				2	
LO5						2				2	
LO6						2				2	

1 – Introduce 2- Reinforced 3 Emphasized

FINAL COURSE OUTPUT:

As evidence of attaining the above learning outcomes, the student is required to do and submit the following during the indicated dates of the term.

LEARNING OUTCOME	ASSESSMENT METHOD	DUE DATE
LO2, LO3, LO4	Mini Ethics Bowl	10th week
LO2, LO3, LO4	Term Project (Video)	13th week

RUBRICS FOR ASSESSMENT:

Sample Grading System (mini ethics bowl)

Criteria for Assessment	Description	Weight of Scores for Class Grading	Learning Outcome Assessment
Clarity and Intelligibility	Student was able to present position in a logical and consistent manner	25	(see rubric)
Depth and Substance	Student was able to identify and discuss the ethical factors relevant to the case	25	(see rubric)
Ethical Relevance	Student was able to present position without inclusion of factors that are irrelevant/have minor relevance	25	(see rubric)
Deliberative Thoughtfulness	Student was able to consider various different viewpoints and alternatives, considering perception of other stakeholders	25	(see rubric)

Sample Rubric for Mini Ethics Bowl (Second Criteria: Depth and Substance)

Assessment Score	Description	Details
1	Very Poor	Student failed to identify/discuss any ethical factors or considerations that are relevant to the given case.
2	Poor	Student was able to identify and discuss some relevant ethical factors/ considerations, but such were considerably minor and insufficient to support argument.
3	Fair	Student was able to identify and discuss some relevant ethical factors/ considerations enough to support argument, but lacks depth of analysis of factors in relation to the case
4	Good	Student was able to identify and discuss the relevant ethical factors/ considerations and provided a sound analysis to relate the identified factor(s) to the case.
5	Excellent	Student was able to identify and discuss critical and important relevant ethical factors/ considerations, providing both a clear link and an in-depth analysis that strongly relates the identified factor(s) to the case.

Term Project (Video)

CRITERIA	1 = Not Acceptable	2 = Below Expectations	3 = Meets Expectations	4 = Exceeds Expectations
Identification of main issues / problems 40%	Identifies and understands few of the main issues in the case study	Identifies and understands some of the main issues in the case study	Identifies and understands most of the main issues in the case study	Identifies and understands all of the main issues in the case study
Analysis of the Issues 40%	Incomplete analysis of the main issues in the case	Superficial analysis of some of the main issues in the case	Thorough analysis of most of the main issues in the case	Insightful and thorough analysis of all the main issues in the case
roposed solution /s to the issues 30%	Proposed solutions to the case are not based on ethical theories learned	Some of the proposed solutions to the case are based on ethical theories learned	Most of the proposed solutions to the case are based on ethical theories learned	All proposed solutions to the case are based on ethical theories learned

Grading System

The student will be graded according to the following:

Midterm Exam	20%
Final Exam	30%
Mini – Ethics Bowl-	20%
Term Project (Video)	20%
Class Participation	10%
Total	100%

Passing: 60%

Learning Plan

Learning Outcome	Topic	Week No.	Learning Activities
LO1, LO2	The Mechanical Engineering Profession	1	Lecture, Class Discussion
LO1, LO2	The Mechanical Engineer in Society	2	Lecture, Class Discussion
LO2, LO4 LO5	The Mechanical Engineering Law	3	Oral Report, Class Discussion
LO1, LO2, LO3, LO4	The Mechanical Engineer's Code of Ethics	4, 5	Lecture, Class Discussion
LO3, LO4	Ethical Theories (Duty Ethics, Right Ethics, Utilitarianism and Virtue Ethics)	6, 7	Case Studies, Debate, Class Discussion
	Midterm Exam	7	
LO1, LO2, LO3, LO4	Ethical Issues and Case Studies in Engineering	8, 9, 10	Case Studies, Mini – Ethics Bowl, Role Playing (Video)
LO1, LO6	Local and International Codes and Standards	10, 11	Oral Report, Class Discussion

LO1, LO6	Contracts and specifications	12, 13	Lecture, Case Studies, Class Discussion
	Final Exam	14	

References: (Sample Only)

1. Engineering Ethics: Concepts and Cases by Harris, Pritchard and Rabins, 2009
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3. Introduction to Engineering Ethics by Schinzinger and Martin, 2000
4. Ethical Issues in Engineering by Deborah Johnson, 1991
5. Contracts, Specifications and Engineering Relations by Mead, Mead and Akeman
6. Philippine Society of Mechanical Engineers Code
7. Philippine Mechanical Engineering Law

Class Policies (Sample only)

1. There will be a midterm and a final exam in this course. Make – up exams will be given provided the reason for not taking the exam is excused as stipulated in the student handbook.
2. Regular attendance is expected. Attendance policy as stipulated in the student handbook will be implemented.
3. Students are encouraged to see the faculty during the scheduled consultation periods in case they have questions regarding the topics discussed in class.