

## **EXPLORING ENGINEERING ETHICS USING AN ON-LINE, ASYNCHRONOUS SEMINAR**

**Dennis E. Kroll**

*Bradley University, East Peoria, Email: dek@bradley.edu*

### **1. INTRODUCTION AND HISTORY**

During 1994, The Lilly Endowment sponsored a faculty enhancement program dealing with issues of diversity, tolerance, and how to teach these issues to the entire student body. Each participant was to develop a mini-course to be offered during a two or three week session. Kroll and Anglin (1995) developed a Professional Ethics course to be offered to Nursing and Engineering students and team taught, often using stereotypical examples of nurses and engineers.

For various reasons this course was never offered although the College of Engineering and Technology showed interest in allowing credit for such an endeavor. The course was then changed into strictly an Engineering Ethics course and offered under the Honors Program as a one-hour seminar course. This course was offered twice in the standard once-a-week meeting format of the seminars.

At this time, Bradley was beginning to develop on-line course facilities; this led to an attempt to blend the course into a format suitable for on-line delivery. This was done during 2001; the first offering had 16 students involved. The reviews of the course by these students encouraged the Honors Program to continue with experimentation on the on-line format of the seminar.

The following sections describe the modifications, successes, failures, and extensions to this course. The course is actually being offered during this semester and is being “attended” by this author even while at this conference.

### **2. FORMAT OF THE COURSE**

During the standard offerings of this course on Engineering Ethics, the students were required to read a chapter or more from the text each week and then meet for one hour to discuss their observations, reservations, and/or discoveries. The discussions were led by a student and each student had two such assignments. When moving to the on-line format, a similar sequence of events was desired; however, getting the conversations started was considered the most difficult

task. Also a final paper was required on a topic from the text of each student's choice; this replaced the short write-ups done when leading the seminar.

In order to encourage all students in the course to participate, the majority of points earned in the course was by taking part in a discussion of selected topics. These topics were selected by the instructor and posted on a bulletin board as questions to be answered or statements to be commented upon. Each substantial comment earned a point with a maximum of 3 points per week. To the students' credit, few of them stopped discussing after having posted 3 responses. Further, they also responded to each other very well; arguing topics and occasionally getting a bit personal as many knew each other from various other courses. (An interesting finding was which majors tend to use what type of language.)

In the first offering of the course, the required papers were discussed among the students; the points available for the paper were sufficient to change a grade by one letter. Grading was 75% on content, 15% on grammar and spelling, and 10% on style and format. This last issue being something few, if any, of the students had thought about prior to this course. Points were earned both by posting comments on others papers and also for inducing comments on a student's own paper. This last issue encouraged students to expand the limits of their thoughts on ethics and some did indeed provoke vigorous discussions. A very few even took stands on issues which they themselves did not actually hold nor that most others would hold in order to provoke their classmates into proving them wrong. The counter-arguments this elicited were often well thought out and developed in a very reasonable way.

### 3. TEXTS

One of the original drivers of this course was a keynote address at an ASEE National Conference. A text by this speaker (Harris et al., 1995) was used as the first text for both the traditional seminar and the first on-line offering. This is an excellent text and develops concepts with examples and logic suitable for undergraduate engineering students. However, the third edition of this book costs over \$65. This is rather expensive for a one-hour, elective course. While it is a good resource with excellent case study development, the only copy the students in this course now see is on reserve in the library.

After significant searching, this instructor settled on *Engineering Ethics* (Fleddermann, 1999.) This text is less thorough than the Harris text but does have good coverage of high profile ethics problems and does provide questions about the cases and core ethics issues. However, there is little theoretical development of various tools used in resolving ethical questions. A slightly expanded second edition of Fleddermann's book is available for under \$27, about 40% of the original text by Harris et al. The new edition does not address the lack of theoretical development.

#### 4. TOPICAL CONTENT

The syllabi of both the traditional face-to-face seminar and the first on-line offering are in the appendix. (The current syllabus is available to guests at <http://blackboard.bradley.edu> at the HON 101-44 course.) Both begin by discussing why applied professional ethics are important to engineers. The traditional format also used videotaped ethics presentations prepared at Duke University to begin the introspection process. Both spend time on the various codes of ethics of various engineering societies. The techniques of solving ethical/moral problems are explored, though the Harris text delves significantly deeper in this area. Risk, safety, environmental, and liability issues are covered. Finally, different roles played by engineers – as employees, employers, and as keepers of public trust – are explored. The course ended by playing the “Dilbert Ethics Challenge” developed by Lockheed-Martin.

#### 5. RESULTS AND CONCLUSION

While the course has generally been open only to students admitted to the Honors Program, a few other students have been allowed to take the course; they had heard about it from a friend or roommate. The honors program has waived rules concerning who may take this course. One student took the course twice, once with each of the texts. Very few students have started the course and then dropped it. This semester (Spring 2005) a computer science major is enrolled along with engineers from all departments.

The only complaint from the students is the fact that the instructor does not jump in to the discussion very often. As the instructor, my explanation is that I pick the topics and write the questions with my slant on the issues. The students need to work their way through the issues without the potential dominance of the instructor. One possible reason for the course’s success is that it is the only honors seminar developed by an engineering faculty member and the only one focusing on an engineering issue. Students have inquired about the offering both prior to and during registration times.

After the success of this course, a course on Technology and Society was developed using the same on-line format. The text used is *Engineering & Society* (Johnston et al., 2000) which covers a number of social issues. This course is also well populated and not only by engineers. Together, the two seminars provide coverage of a number of “soft” ABET requirements such as ethics, global issues, etc. By offering these two courses and requiring an engineering student to take them “sometime”, these topics are well covered.

#### REFERENCES

- Fleddermann, Charles B. (1999). *Engineering Ethics*, Prentice Hall, Upper Saddle River NJ.
- Harris, Charles E. Jr., Michael S. Pritchard, & Michael J. Rabins (1995). *Engineering Ethics*, Wadsworth Publishing, Belmont CA.
- Johnston, Stephen F., J. Paul Gostelow, & W. Joseph King (2000). *Engineering & Society*, Prentice Hall, Upper Saddle River NJ

Kroll, Dennis E. & Linda Anglin (1995). Social Issues in the Professions: An Ethics Approach, in *Race, Ethnicity and an American Campus*, Timothy K. Conley editor, Bradley University Peoria, Illinois.

## APPENDIX 1 – CLASSIC STYLE SEMINAR

W noon - 1:00 p.m.  
Morgan 106  
Text: Engineering Ethics  
by Harris et al.

ENGINEERING ETHICS  
HON 101- 42  
  
Spring 1999

Dennis E. Kroll  
Morgan 109C X-2746  
Office MTWT 10-10:45  
Hours: F 11 - 11:45  
dek@bradley.edu

Date	Readings	Topic	Notes
1/20/99	Pg 1-14	Introduction	Video Cases 1 & 2
1/27	-----	Video Cases 3 & 4	-----
2/3	25-41, 55-77	Professionalism/Codes Engineering Responsibility	-----
2/10	95-117	Moral Thinking	-----
2/17	125-145	Methods of Moral Problem Solv.	2 presentations
2/24	155-174	Tests in Moral Problem Solving	2 presentations
3/3	187-214	Honesty & Responsibility	2 presentations
3/10	-----	Dilbert Ethics Game by Lockheed-Martin	
3/24	227-252	Risk, Safety & Liability	3 presentations
3-31	265-299	Engineers as Employees	3 presentations
4-7	265-299	" " "	3 presentations
4-14	315-344	Environmental Concerns	3 presentations
4-21	355-377	Promoting & Enforcing Ethics	3 presentations
4-28	-----	Review & final cases	3 presentations

### Grading

Each student will present and lead a discussion on 2 cases. Cases may be from the text or from ethics internet sites. (These will be listed under course resources at <http://bradley.bradley.edu/~dek/resources.html> See the entry for engineering ethics links.) A one to two page write-up is requested. Preparation and presentation are worth 30 points; 3 points will be awarded for stimulating discussion. The other 34 points can be earned by participation in other cases both in class and via e-mail. (A course alias will be available.) Post your case selections to the class via this alias. Participation points are subjective; relevance and insight are key. 60 points is passing.

### Goal

Students successfully completing this course will have developed a basis for articulately discussing problems and situations in ethics for professionals, especially engineers. Cases are used in an attempt to bring real situations into the lives of real people.

### General

The schedule and procedures in this syllabus are subject to change in the event of extenuating circumstances. Any student with difficulty in meeting these requirements should contact the instructor as soon as possible for an attempt to resolve the difficulty. This especially includes class dates the student will be unavailable.

## APPENDIX 2 – FIRST ON-LINE COURSE

W 1:00-1:50	Engineering Ethics	Dennis E. Kroll
Morgan Hall 106	HON 101-45	Morgan 109C X-2746
text:	Spring 2001	dek@bradley.edu
Engineering Ethics by Fleddermann	~~~ TTF 11-11:45	Office Hours: MW 2-2:45

This course will meet only occasionally, including the first day. All other meetings will use BlackBoard at <http://blackboard.bradley.edu>. Students may meet asynchronously as they wish; schedules for chat rooms will be set during the semester.

Students are expected to participate constructively, especially when they disagree with a point made in a discussion thread or in a chat room. The goal of this seminar is to develop a sense of what each student sees as ethical professional conduct and how to analyze situations and problems arising in everyday work experiences.

Grading will be based on participation and on two case studies to be developed by each student. These will be chosen during the semester. Each student should prepare a case both before and after spring break. Each of the 14 weeks will provide for 3 points toward participation, each case provides 25 points for preparation and 4 for discussion/defense.

Descriptions of good case studies, and the schedule for covering chapters will be found on the blackboard site for the seminar.

Schedule (sort of):

Week of 1/28 - Chapter 1

Week of 2/4 - Chapter 2

Weeks of 2/11 & 2/18 - Chapter 3

Weeks of 2/25, 3/4, & 3/11 - Chapter 4

Weeks of 3/25 & 4/1 - Chapter 5

Weeks of 4/8 & 4/15 - Chapter 6

Weeks of 4/22 & 4/29 - Chapter 7

Week of 5/6 - Chapter 8

We will also meet once to play the Lockheed "Dilbert Ethics Challenge" Time to be determined; perhaps a pizza lunch or dinner.