

## AN ABET-BASED SEMINAR COURSE

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**Abstract** - The Accreditation Board for Engineering and Technology (ABET) requirements for accreditation changed in many ways starting in the year 2000. New accreditation rules require evidence that engineering students acquire a broad education that goes beyond traditional engineering topics and includes areas such as ethics, team work, oral communication, life-long learning, and an awareness of the impact of engineering on society to name just a few. ABET also requires a process for continuous assessment and improvement of the educational program. This article describes a seminar course established to address some of the new ABET requirements and help achieve department-stated outcomes and objectives.

**Index Terms** – ABET, Accreditation, Engineering education, Seminar.

### INTRODUCTION

The University of West Florida Electrical and Computer Engineering Department is a cooperation between the University of West Florida in Pensacola, Florida, and the University of Florida, in Gainesville, Florida. This cooperation was established to assist the University of West Florida in starting an engineering program that offers well-established ABET-accredited degrees in Electrical Engineering and in Computer Engineering. UWF sought separate accreditation for its engineering degree programs in Fall 2001. Facing the new ABET-2000 requirements for accreditation [1], the curriculum was reviewed and upgraded by department faculty with the introduction of a required senior seminar course that covers topics such as ethics in engineering, provides a forum for students to prepare and give oral presentations, and offers students discussions on a variety of topics of importance to engineers. While the seminar presentations and topics differ every time the course is offered, certain subjects like “Ethics in engineering” and “Safety in the workplace and OSHA regulations” are constant parts of the course program.

This article presents the organization of the seminar course, a list of representative presentation topics, and the relevance of the seminar course to the ABET requirements for accreditation. The course is fairly dynamic in its structure and lends itself to easy modifications and

improvements in response to various assessments of the course in relation to its objectives.

### SEMINAR COURSE ORGANIZATION

The course is assigned to one faculty that supervises its overall structure and operation. The schedule consists of one three-hour-long meeting every week and each meeting can take one of three forms:

1. A lecture by the course instructor.
2. A presentation by an invited speaker
3. A presentation by a student or team of students.

All lectures and presentations include debate-style discussions or questions and answers sessions that allow students to explore any given topic further. To insure that every student that successfully graduates from the UWF/UF-ECE program has been exposed to this seminar course, all students must take this course in order to graduate. The seminar class is offered once a year and is open to juniors or seniors.

### ATTENDANCE AND GRADING POLICY

In the seminar class, attendance is mandatory and verified at the beginning of every class meeting. Part of the student grade is based on attendance as discussed below. Since situations do arise in which students are unable to attend, the course syllabus offers a way for students to miss a presentation, but for every presentation missed, students must submit a written report on the topic of the missed presentation. The report is graded for content and quality and the report grade replaces the student attendance grade for the missed presentation.

Besides attendance, student participation in discussions and debates is also assessed by the course instructor and is included as part of the grading scheme.

Finally, several class meetings are dedicated to student presentations and are graded on the overall quality of their presentation to the class. While the relative grading weights assigned to each part of the course is left to the course instructor, here is an example scale used by the author:

Attendance	60%
Participation	10%

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Student presentation	20%
<u>Student report</u>	<u>10%</u>
Total	100%

The attendance grade for each class meeting is assigned as 60/n % for each seminar presentation where n is the total number of presentations in the semester.

The grading scale presented here is designed to entice students to attend all seminar presentations, to insure that students are motivated to participate in discussions and debates, and to provide an incentive to prepare and deliver a good quality presentation.

The student report serves two purposes. Firstly, it provides an instance for students to practice and demonstrate their written communication and presentation skills. Secondly, it serves as an assessment measure as described below.

### LECTURERS AND PRESENTERS

Seminars are given by invited lecturers from academia, industry, administration, government, the military, and among community leaders. The choice and invitation of presenters is left to the course instructor and the only requirement is that lecturers be recognized experts in their presentation topic. In the case of UWF for example, the local power company, Gulf Power, has several dedicated and knowledgeable engineers willing to volunteer their time to provide well-prepared presentations on Ethics, Professional Licensure, Safety in the work place, and other topics.

### PRESENTATION TOPICS

The presentation topics are chosen to offer a general overview of the engineering profession, its importance in society, and the many aspects of its impacts and effects on human advancement. A few presentation topics for the course are required. Ethics in engineering, for example, is a required subject that must be covered by the seminar series and may actually be the main area of several seminar lectures. Presentation topics include the following:

- Safety in the workplace and OSHA rules
- Engineering professions
- Engineering Licensure
- Working in a small or large engineering company.
- Applications of statistics in engineering.

### STUDENT PRESENTATIONS

Students are required to develop and deliver a presentation on a topic of their choice. It is often very educational and refreshing to hear students present and discuss a variety of topics. Their perspective is often clear and insightful. Examples of student presentation topics from past seminars are listed here:

- Ethical considerations in NASA's "Challenger disaster"
- A brief discussion of alternate energy sources
- High Definition Television
- The UWF autonomous submarine team
- Robotics in healthcare
- The Three Gorges Dam project
- Sexual harassment in the workplace
- The history of robotics
- Photonic detectors and applications
- Orcad capture and layout software
- The Bio-Chip
- Fuel Cell technology and its future applications
- Robotics & toys
- Professional audio recording systems

Students are highly encouraged to prepare their presentation using computer tools like the Power Point presentation software and embed supporting audiovisual media like images and movie clips to accentuate their presentation.

### ACCREDITATION CONSIDERATIONS

**Program objectives and outcomes:** As per ABET accreditation requirements [1], the UF/UWF-ECE program established program objectives as listed in [2] and [3] with 13 outcomes achieved by program graduates [4] and listed here:

1. Knowledge of mathematics through differential and integral calculus, and advanced topics in differential equations, linear algebra, and complex variables.
2. Knowledge of core electrical and computer engineering topics.
3. Ability to use modern engineering techniques, skills, and tools, including computer-based tools for analysis and design.
4. Ability to apply knowledge of mathematics, science, and engineering to the analysis of electrical engineering problems.
5. Ability to design and conduct scientific and engineering experiments, as well as to analyze and interpret data.
6. Knowledge of probability and statistics, including electrical engineering applications.
7. Ability to identify, formulate, and solve novel electrical engineering problems, including the planning, specification, design, implementation, and operation of systems, components, and/or processes that meet performance, cost, time, safety, and quality requirements.
8. Ability to function on multi-disciplinary teams, where possible.
9. Understanding of professional and ethical responsibility.

10. Ability to communicate effectively in writing and to convey technical material through oral presentation and interaction with an audience
11. Broad education and knowledge of contemporary issues necessary to understand the impact of electrical engineering solutions in a global and societal context.
12. Recognition of the need for, and an ability to engage in life-long learning.
13. Knowledge of discrete mathematics

While all outcomes are satisfied in part by several components of the curriculum and it is possible, through various assessment measures, to demonstrate that fact, some of these outcomes, for example outcomes 8 to 12, are difficult to insert in regular engineering courses and laboratories and particularly difficult to assess and demonstrate. The seminar course described here is designed to assist in this task.

The seminar course, organized as described, assists in satisfying in part or in whole, program outcomes 8 through 12 stated above and repeated here for convenience.

**Outcome 8** “An ability to function on multi-disciplinary teams, where possible.”

In the required student presentations, students are encouraged to work in teams of two to three to prepare and deliver their presentation. In team presentations, every student is required to speak to the class to insure that every student experiences the joy, for some, or agony, for some others, of speaking to a large audience and interacting with it.

**Outcome 9:** “An understanding of professional and ethical responsibility.”

One or more of the presentations given by invited professionals is on the subject of ethics on the job. Additionally, at least one student team invariably chooses a topic which directly or indirectly relates to ethics in engineering. As an example in the list of topics for students given above, a case study on ethics is NASA’s well documented and known Challenger space shuttle disaster. Another example is the presentation on sexual harassment, given by two female students, which discusses unethical behavior on the job as it relates to sexual harassment.

**Outcome 10:** “An ability to communicate effectively in writing and to convey technical material through oral presentation and interaction with an audience.”

The student presentation part of the seminar course directly addresses and largely contributes to the fulfillment of this outcome. Every student is required to develop and deliver a presentation and interact with an audience through a questions and answers session.

**Outcome 11:** “The broad education and knowledge of contemporary issues necessary to understand the impact of electrical engineering solutions in a global and societal context.”

The seminar course offers a platform for exposing students to a variety of topics related to the engineering profession. This outcome is a difficult one to implement, assess, and demonstrate. While every course in the curriculum, when well taught, contributes to broaden the education and knowledge of contemporary issues, the seminar course, through its various topics and discussions, exposes students to a variety of points of views and presents several examples of the impact and contributions of engineering solutions to society at large. The variety of topics discussed in the course attests to this fact.

**Outcome 12:** “Recognition of the need for, and an ability to engage in life-long learning.”

This outcome is difficult to assess but the seminar course is one of the best venue to expose students to the breadth and extent of engineering in today’s society and to the increasing pace of engineering progress. The fast accumulation of engineering knowledge makes the need for life long learning evident.

### Course Assessment And Improvement

A process for measuring the effectiveness of the seminar class in addressing department outcomes 8 through 11 can be established as described in the block diagram of Figure 1. Assessment measures include:

1. Department faculty curriculum committee decisions
2. Student surveys
3. Invited speaker’s surveys

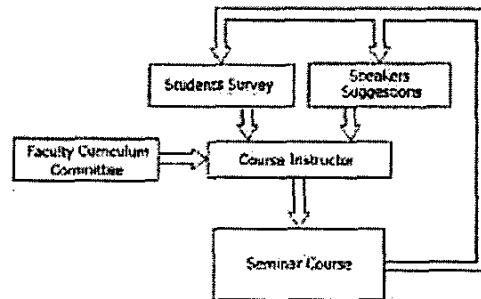


FIGURE 1.  
COURSE ASSESSMENT AND IMPROVEMENT DIAGRAM

**Faculty curriculum committee.** The faculty of the department collects general assessment measures from all the program constituencies [4] and makes decisions for improving the quality and effectiveness of program education on a continuous basis. Some department concerns or improvement needs can be best addressed by the seminar course which is then modified to that effect.

**Student surveys.** Students evaluate the seminar class and the instructor as part of the normal evaluation process for every course. These student evaluations serve as one assessment measure of the course effectiveness in achieving its purpose. The students are also required to write and submit a report that addresses their opinions on the course effectiveness particularly in relation to program outcomes. The report consists of student responses to requests of the type listed here:

- a) Discuss the importance of Ethics in engineering and provide an example of ethical dilemma that may face an engineer on the job.
- b) What is your opinion on the importance of engineering in society? Discuss the contributions of electrical or computer engineering in an area like agriculture, the arts, the economy, transportation systems, medicine, or any other discipline of your choice.
- c) Has engineering in general improved the quality of life for people? State and defend your opinion.
- d) Explain why an engineer's education should not and does not stop at graduation. Give examples to support this statement.

**Invited speakers.** The seminar speakers are part of the broad engineering community. They are asked to provide their opinions on the seminar course, student responses to their presentation, and the choice and relevance of their topic of discussion as well as any recommendations they may have in relation to the seminar course.

The course is taught once a year, usually in the Fall semester. The instructor reviews the assessment measures discussed here and decides on how to modify and improve the next course delivery.

Actions that can be taken to improve the effectiveness of the seminar course in relation to the program outcomes include the choice of seminar presentation topics and invited lecturers, modification of the grading system, and modification of the course organization. As an example of the course improvement process, actions to be taken in response to current assessments are the inclusion of a seminar presentation on Ethics in Academia, which will concentrate on students and faculty ethical choices, and the inclusion of the student report discussed above which will serve as an assessment tool for program accreditation as well as an assessment tool for the course.

### CONCLUSION

This paper presents a seminar course developed by the author and his colleagues at the Department of Electrical and Computer Engineering of the University of West Florida to assist with the department's ABET accreditation efforts. The seminar course exposes students to a variety of topics related to the engineering profession and its broad impacts on society. The seminar course is also the principal mean by which engineering students are exposed to ethical considerations and dilemmas that can occur in the engineering profession. Students are asked to discuss case studies of ethical situations that face engineers in the workplace. The course requires that students prepare and deliver a presentation on a topic of direct relevance to engineers and submit a written report pertaining to one of the program outcomes. The presentation helps ensure that every student is given an opportunity to communicate orally and interact with an audience as required by new ABET accreditation rules. The written report encourages students to ponder the need for life-long learning, the importance of engineering in today's society, and the ethical situations that arise in the practice of engineering. Finally the course is assessed and modified to maintain its currency and relevance with respect to current events, recent advances in engineering, and its effectiveness in achieving program outcomes.

### ACKNOWLEDGMENT

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### REFERENCES

- [1] Accreditation Board for Engineering and Technology, Inc. "Criteria for Accrediting Engineering Programs." November 2000. [http://www.abet.org/images/Criteria/eac\\_criteria\\_b.pdf](http://www.abet.org/images/Criteria/eac_criteria_b.pdf). Internet document.
- [2] University of Florida/University of West Florida Electrical Engineering Program, "Electrical Engineering Program Objectives." <http://uwf.edu/ece/about/#ee> Internet document.
- [3] University of Florida/University of West Florida Electrical Engineering Program, "Computer Engineering Program Objectives." <http://uwf.edu/ece/about/#ce> Internet document.
- [4] University of Florida/University of West Florida Electrical Engineering Program, "Engineering Criteria 2002 Program Self-Study Report". June 2002.