

Understanding Engineering and Technology for Liberal Education

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Abstract

It is important to introduce philosophy, basic concept and importance of engineering and technology to non-engineering major students as well as engineering major students. A novel course "Understanding of Engineering and Technology" was open as a part of liberal education at Seoul National University. Sixteen faculties in engineering college participated in preparing a text book and making lectures. The lectures were performed for one semester and the course was evaluated by the students as being easy and useful. Even though some improvement is still required, this activity can be extended to high school students and engineering major students.

Introduction

Engineering and technology are changing our society in every aspect of our daily life. It is therefore important to understand engineering and technology to live in high-technology society. Some examples of such requirement are in the areas of computers, information and communication, biotechnology, new materials, environment and robotics.

For the development of engineering and technology and for the engineers to be highly respected in this society, the importance of engineering and technology is to be recognized and appreciated from the society as well as from the engineers. Recently, interdisciplinary works relating to engineering and technology are becoming more and more important especially in socio-technological area, patent law, environment, technology, education and medical fields. It is thus important to educate basic concept and recent advances in engineering and technology to the students whose majors are not engineering. They can not only perform their roles better in high technology society, but also, we hope, support the development of engineering and technology based on the understanding of engineering and technology. In these respects, the College of Engineering at Seoul National University has opened a course on engineering and technology at the university level.

Course Development

As a part of liberal education, a new course named "Understanding of Engineering and Technology" with 3-credit hours was approved from the University. There are many courses in natural science field which are open and recognized as liberal education. Very few course had been introduced for this purpose in engineering field (only one: "Energy

and Society" at Seoul National University). Since engineering and technology contain broad disciplines and subjects, 16 faculties were called voluntarily and organized as potential instructors for the course. Once this group was organized, discussion on engineering education in general as well as for the preparation of the course were initiated.

First, we discussed the goals, current situation and problems in engineering education. One of the important things is to make high school students and non-engineering major students to be interested in engineering and technology so that we can have better freshmen in engineering field and to have better supports from the society.

To achieve this goal, we decided to choose only the topics in engineering areas which can give interest and significant meaning to the students. It is not desirable to mention all the engineering principles. Next thing is to prepare a text. Since books dealing with overviews of engineering had not been introduced well, we decided to write a text. For future publication and the assistance to the writing, we contacted the local publishing company and discussed about writing a text.

Following guidelines were made from the discussions with the publisher and distributed to the participating faculties

(1) Should be easy and interesting.

Handout can be used if details and advanced topics of engineering are required.

(2) Past and present development are to be explained and should give visions on engineering areas.

(3) Contain examples of short story on engineering for better understanding.

(4) Worldwide situation as well as local situation is to be mentioned.

(5) Deal with social and cultural issues as well as issues on daily life.

The contents of the text were fixed as follows (Followings are not the titles of the text but the contents.).

1. Introduction to and overview of engineering and technology

-What is engineering and technology?

- Differences between science and engineering

-Engineers' role in the society

2. Engineering and technology in multi-media society

-semiconductor

-information and communication

-computer technology

3. The world of materials

4. Power of molecules and biology

-overview of chemical engineering

-new chemical materials

-specialty chemicals

-environmental and clean technology

-biotechnology

- 5. Machines and our life
 - aerospace engineering
 - mechanical engineering
 - shipment and ocean engineering
- 6. Architecture and construction
 - architecture
 - civil engineering
- 7. Energy
 - overview of energy
 - fossil energy
 - atomic energy
 - electric energy
 - energy in 21th century

The text was finally prepared after many revisions during the writing, we had a chance to discuss on engineering and technology with the high school students. This discussion gave us the ideas on how to teach engineering and technology to non-engineering major students.

Lectures

First course was open for Fall Semester, 1994. 90 students were enrolled from liberal arts, social science, natural science, agriculture technology, teachers college, and many other disciplines. We asked the students to read the related subjects in the textbook before the class and to submit a report on the lecture and the textbook after the class. Two term papers were required to submit instead of examinations.

Following evaluations were obtained from the students.

Texts were generally easy to understand. Figures and tables should accompany explanations.

Lectures were generally interesting and useful. Too many subjects topics were introduced during a short lecture time.

Relationship between engineering discipline and other disciplines are to be more emphasized.

Comparison of engineering and technology levels between Korea and other countries should be made.

(5) More references books are required.

Discussion

It is important for national interest to have better students in engineering area. It is necessary to introduce the concept, advances, and applications of engineering and technology to high school students and citizens as well as to non-engineering major students. This idea is currently practiced in USA, Japan, and other countries. Therefore our next task is to have contacts with high school teachers/students.

In engineering college, the students usually study their own disciplines. It is also important for students in engineering college to understand other engineering disciplines and have an overview on engineering area. Therefore it is recommended to provide this course even to engineering major students with somewhat different context.

We understand that each country has its own cultural tradition and social backgrounds. Introduction of this kind of concept and philosophy on engineering and technology should consider the backgrounds of the country. However, we believe that the introduction of engineering and technology to non-engineering major students as well as engineering major students will promote the internationalization through the understanding of high technology which connect the world nowadays. In conclusion, we think it is very useful to provide a course on engineering and technology as a part of liberal education for the development of engineering and technology.