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A CULTURAL ENGINEERING COURSE FOR NONENGINEERS

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As our western civilization has continued to advance, the contributions by the engineer have become steadily more important. However, very little effort has been made by others to inquire about his methods or his background. Engineering students on the other hand have for many years broadened their social and personal backgrounds by taking courses in other colleges of the university, thereby better preparing themselves to carry out their responsibilities to their future employers and society as a whole.

Many nonengineering students upon graduation will have to deal with engineers and engineering developments either directly or indirectly, and some have indicated a desire for a course that would broaden their knowledge of the field of engineering. In addition to these requests many noted engineers, administrators, and educators, such as James B. Conant, former President of Harvard University and present High Commissioner of Germany, have also written about the need of such a course designed for the nontechnical student.

At the University of Illinois a new and pioneer course, developed to satisfy this demand, is being offered for the first time this year. General Engineering 250—The Philosophy and Methods of Engineering—is open to nonengineering students only. The one prerequisite of the course is that the student has at least a junior standing in the University. The course was developed by a committee whose members are from all departments within the College of Engineering.

After preliminary discussions within the committee and consultation with educators in the fields of commerce, political science, history, sociology, education, law, and philosophy as well as other fields, the committee was convinced that such a course would fill a void that has existed for a considerable length of time. The favorable comment from others for such an undertaking spurred the committee on to work out a suitable course outline.

The committee outlined the objectives of the course as follows: (1) To develop an understanding of engineering principles and an insight into the analytical methods of engineering so that the student will be able to apply the same approach to problems in his particular field; (2) To review historically the role that engineering has played in the development of Western civilization with respect to religion, commerce, and government so that the student would have an appreciation of how engineering is integrated with other social institutions; and (3) To develop an understanding of what an engineer is like and what types of projects the engineer is qualified to undertake, and to point out that in

many cases the engineering solution to a particular problem is but one step in an overall solution which requires the cooperative effort of people with backgrounds in disciplines other than engineering.

Keeping the above objectives in mind, the committee outlined a basic course, dividing it into four major parts: Part I, Historical Background; Part II, Characteristics of Engineering; Part III, Engineering Problems and Methods; and Part IV, Sociological Aspects of Engineering.

In Part I, Historical Background, emphasis is placed upon developments of an engineering nature in prehistoric cultures when man first began to harness the forces of nature for the purpose of improving his standard of living. Many of the developments discussed are still in the process of development today, among these being such items as transportation, agriculture, urbanization, and communication. The principle that "necessity is the mother of invention" is brought out, as well as the continual correlation between the development of Western civilization. The history of scientific thought is presented from the first contributions of deductive reasoning by the Greeks through the development of inductive Newtonian methods during the seventeenth century to the present-day methods of science and technology. Starting out with a historical approach has proved to be very effective during development of other phases of the course.

In Part II, Characteristics of Engineering, the terms *engineer* and *engineering* are defined and discussed. The evolution of scientific thought is discussed, and particular care is taken to differentiate between science and engineering. The importance of research and development with respect to engineering is also pointed out. The work performed by various kinds of engineers is discussed and the student learns the differences in the work of a mechanical engineer, civil engineer, and other types of engineers.

Perhaps the most challenging part of the course is Part III, Engineering Problems and Methods. Most of the students have not had any college mathematics, therefore a nontechnical approach is used, outlining the two main branches of formal logic—deductive and inductive. Then the so-called "engineering method" is outlined in these terms. Examples of actual engineering problems are used that vary in difficulty from simple arithmetical computations to more complicated solutions involving calculus. The students work some of the simple problems while the more difficult ones are discussed in class. The reaction of the students to this approach has been very gratifying, particularly since there is evidence that they are able to apply some of the principles of engineering to problems in their respective fields.

In Part IV, Sociological Aspects of Engineering, the emphasis is placed upon the interaction of engineering and other social forces. The effects of inventions and engineering developments upon our social system are discussed at length, particularly with respect to the possibility of making predictions. The problems that remain to be solved as a result of engineering advancements are discussed and solutions are proposed. It is pointed out that many

of these problems can only be solved with the cooperation of several disciplines working together.

One of the greatest problems is to get information about this course to prospective students. In the past so much mathematics was required as a prerequisite that a nonengineering student did not have time to pursue any interests in engineering. Because of this, the nonengineering student is not accustomed to look for an elective course in the College of Engineering. It will take time to build the course up; however, we in the College of Engineering who are associated with the development of this course feel that the time necessary to do this will be well spent.