CEAS Educational News Article

Engineering Foundations (ENED-1020)
A New Class Introducing Students to the World of Engineering

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“I like this class. I like its simplicity. It covers the foundation of engineering and different engineering areas.” This is how one of the freshmen students in the Engineering Foundations class at the University of Cincinnati (UC) described the class. Engineering Foundations is the first course developed by the relatively young Department of Engineering Education in the College of Engineering and Applied Science (CEAS) at UC.

Dr. Carlo Montemagno, former Dean of CEAS, wanted to attract more students to engineering and improve student retention rates. Thus, he led the establishment of the Department of Engineering Education (DEE) which was formed on July 1, 2007. DEE is part of CEAS’s efforts to transform the way in which undergraduate engineering students are educated and to better prepare students for their future as engineers. DEE is located in the new Alumni Engineering Learning Center which was constructed on the eighth floor of Rhodes Hall and is equipped with state-of-the-art facilities (see Figure 1). The mission of DEE includes:

- To assure the delivery of the highest quality teaching and learning experience to CEAS students with primary emphasis on first year courses.
- To assist the college in providing the highest quality of teaching in the 2nd through the 5th years of instruction.
- To advance the scholarship of teaching and learning.
- To promote societal understanding of the importance of STEM fields to the economic and health of the country.

![Figure 1. The new UC Alumni Engineering Learning Center where DEE is located. The Center is equipped with state-of-the-art facilities for student study and research.](image)

Dr. F. James Boerio was appointed as the first Department Head of DEE. Dr. Boerio has many years of extraordinary experience in research, teaching and administration. At present, the Department of Engineering Education consists of six full-time faculty members, Dr. Kathleen Ossman, Dr. Rod Roseman, Dr. Joni Torsella, Dr. Gregory Bucks, and Dr. Jeff Kastner, in addition to Dr. Boerio, as well as two affiliated faculty members, Dr. Vesselin Shanov and Dr. Ron Huston.

Engineering Foundations was developed by the faculty in DEE and by faculty from the degree programs and is taken by all first year students in CEAS. The course exactly demonstrates the spirit of “transforming engineering education” and how DEE complements conventional engineering courses. The course serves as a College-wide introductory course, enabling entering students to obtain information about the various fields of engineering and technology in CEAS. In the autumn semester of 2013, about
1,140 students were registered in nineteen different sections of the course. Different from many classic engineering courses, Engineering Foundations includes hands-on experimental modules that demonstrate principles in different areas of engineering. The course emphasizes soft skills like ethics, communication, teamwork, problem solving, communication, and knowledge synthesis which are highly appreciated by industry. The modules currently used in the course include solar cells and fuel cells, bridge building and analysis, thermodynamics (Peltier heating and cooling), and basic electrical measurements. These modules enable students to explore mechanical, chemical, and electrical phenomena, and develop the students’ ability in data acquisition, analysis, and presentation. All instructors of this course are professors with excellent teaching experience. Six undergraduate teaching assistants, most of whom have taken the course, are assigned to each section of this course to help students with the experiments and to grade reports. Students take quizzes on their laptop computers. The computers randomize questions which are different for each student. The quizzes are graded by the computers and students immediately receive their scores. The computerized quiz system helps the instructor quickly assess student performance and make any modifications necessary in teaching.

Dr. Mark Schulz is one of the instructors of the course for autumn, 2013 (see Figure 2). He is a professor of Mechanical Engineering and this is the first time he taught the course. He said he liked the idea of having a separate Department of Engineering Education and he particularly liked the course. He thought the course could inspire students’ interest in engineering and help them decide which area of engineering they are most interested in. Also, the TA help and computer-automated quiz system greatly reduced the work load for the course and allowed him to handle a class with sixty students. The TAs are also peers of the students. The students were very comfortable interacting with the TAs. The TAs gave the freshman students advice about engineering and how to succeed in the challenging programs at UC.

![Figure 2. Students in an Engineering Foundations class giving presentations. TA’s for the class were: Collin Dorey, Andrew Fisher, Jane Knauss, Katherine Lupariello, Robert Riemen, and Lauran Weyand.](image)

At the end of the semester, students were asked to choose an engineering grand challenge topic, do their own research, and give a presentation in teams to the class. In Dr. Schulz’s class, the presentations given by the students covered many popular scientific and social topics such as water resources, nuclear energy, solar power, and nuclear terrorism prevention. Dr. Schulz was very satisfied with the quality of the presentations. Dr. Boerio commented that the students were very good at searching for information and making presentations. The students’ communication skills and team work were exercised, and the presentations stimulated the students’ interest in technology and applying technology to solve problems we face in everyday life.

Information on the Department of Engineering Education is at [http://see.ceas.uc.edu/](http://see.ceas.uc.edu/).

Dr. Zhangzhang Yin is a project manager in the CEAS Nanoworld Lab and can be reached at yinzg@mail.uc.edu.