A holistic freshmen-sophomore program was implemented effective summer 2007 that consists of (1) a new Engineering Residential College that serves as the foundation of a new lifelong-learning community; (2) a new approach to teaching mathematics that includes supplemental instruction and a new developmental math course designed to help engineering students for Calculus; (3) an innovative hands-on Introduction to Engineering course that is common to all first-year students in the College; (4) common sections of cohort programs for Mathematics, English, and Speech Communications courses, many of which are offered inside the Engineering Residential College; (5) a six-week, summer math program for underprepared students; (6) a peer mentoring program; and (7) mentoring by faculty and practicing engineers. This presentation highlights our new introductory course known as Engineering 101.

Steps Project Overview

Southern Illinois University's Type I STEP project aims to increase the College of Engineering's five-year graduation rate from 37% to 67% by focusing on first- and second-year retention rates.

<table>
<thead>
<tr>
<th>Class Year</th>
<th>Retention Rates</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>50%</td>
<td>67%</td>
</tr>
<tr>
<td>Sophomore</td>
<td>50%</td>
<td>67%</td>
</tr>
<tr>
<td>Junior</td>
<td>75%</td>
<td>67%</td>
</tr>
<tr>
<td>Senior</td>
<td>100%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Engineering 101 was introduced to the College of Engineering curriculum in fall 2007. It is required of all engineering freshmen and replaces a list of discipline-specific, introductory courses that lacked consistency and failed to recognize the benefits of active learning techniques and construction of learning communities. The new course is intended to reinforce efforts to improve student retention by addressing several key issues that happen student success: difficulty in adjusting to college life; lack of a community atmosphere; disappointment and loss of motivation from the lack of engagement in focused engineering topics during the first and second years.

ENGR 101 radically departs from traditional methods of instruction; it adopts a holistic approach that integrates active and problem-based learning techniques in a variety of settings in order to better inform students and to stimulate interest and excitement about the engineering profession.

The course is taught by faculty co-PIs of the STEP project, with assistance from industry partners (e.g., representatives from Caterpillar, Boeing, and others). The course is designed around the six primary objectives:

- Provide a challenging, yet low-threat, venue for students to become familiar with the broader engineering profession and possible career opportunities;
- Inform students of the various technical specialties within each of the engineering disciplines;
- Guide students in choosing an engineering curriculum and promote informed decision-making when mapping their coursework to career goals;
- Introduce students to the role and importance of engineering ethics;
- Acquaint students with existing, academically-focused support groups and resources and promote development of additional groups that build community; and
- Develop confidence and an appreciation for the importance of mathematics, communication skills, and teamwork through a series of hands-on, laboratory projects in each of the engineering disciplines.

During the 2007-08 academic year, 255 students enrolled in the new course. The majority of these were first-year students involved in other retention-focused efforts (e.g., the Engineering Residential College and mentoring by upperclassmen, peer mentors). The text for the course is *Striving Engineering: A Road Map to a Rewarding Career* by Discovery Press. Specific topics covered during the semester-long course include:

- Processes of engineering majors
- Goal setting
- Internships and career opportunities
- Design and construction of a digital half adder
- Capacitance design, construction and analysis
- AC/DC converter simulation and construction
- Truss design and analysis
- Spring constant determination
- Catapult design, construction and analysis
- Suspension and dexterity
- Physics of a bridge
- Linear representations in engineering, and core analysis tools in civil engineering
- Bridge design and optimization
- Engineering ethics
- AC/DC converter simulation and construction
- Truss design and analysis
- Engineering ethics
- Modeling of engineering design

<table>
<thead>
<tr>
<th>Module</th>
<th>Percentage</th>
</tr>
</thead>
</table>
| 1: Introduction to Engineering | 10%
| 2: Engineering Fundamentals | 20%
| 3: Engineering Ethics | 10%
| 4: Project Planning | 10%
| 5: Engineering Communication | 20%
| 6: Engineering Ethics | 10%

ENGR 101 implementation

Assessing Impact

• Activities pursued under the scope of the STEP project are being reviewed based on the formative assessment information. For ENGR 101, assessment strategies consist of:
  - Pre- and post-semester student attitudes survey
  - Modified and instructor course evaluation
  - Open forums with members of 101 students
  - Assignments aligned with course objectives

Although room for improvement is clearly indicated, these strategies generally reveal positive attitudes about engineering and a cohesive and aware community of learners.

88% of students completing the post-attitude survey indicated that they would be returning to the SIUC College of Engineering the following semester. 26% increase in new freshmen opportunities have also been recognized early on in the project. In particular, the ENGR 101 concept was strongly appealing to prospective students and parents. Project personnel took advantage of the interest by highlighting the course and other STEP activities in marketing materials and campus visits. Doing so is partly responsible for the College's increase in new student enrollment.

Several significant opportunities are also known to students involved in other retention-focused efforts (e.g., the Engineering Residential College and mentoring by upperclassmen, peer mentors). The text for the course is *Striving Engineering: A Road Map to a Rewarding Career* by Discovery Press. Specific topics covered during the semester-long course include:

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50% of students completing the post-attitude survey indicated that they would be returning to the SIUC College of Engineering the following semester. 79% of students indicated that ENGR 101 increased their familiarity with different engineering professions and careers, in engineering, 72% indicated that their appreciation for engineering professions had been increased.

61% of students believed that their course objectives had been met.

80% of students completing the post-attitude survey indicated that they would be returning to the SIUC College of Engineering the following semester. 79% of students indicated that ENGR 101 increased their familiarity with different engineering professions and careers, in engineering, 72% indicated that their appreciation for engineering professions had been increased.

61% of students believed that their course objectives had been met.

“I really liked the hands-on projects, the informative lectures were interesting, but the projects were much more exciting.”

“I think that there were so many engineering freshmen in one class. I almost forced us to establish help networks.”

“They made engineering seem right for me; they explained engineering very well and explained what we could do with an engineering degree.”

Aspects students liked the most were (1) learning about the different disciplines, (2) learning about ethics, (3) hands-on projects, and (4) giveaway prizes.

Recommends for improvement include (1) “more hands-on projects,” (2) “newer projects to be earlier part in the semester,” (3) “I’d love of the basic University 101 type information.

Find out more at www.engr.siu.edu/ETTEP/ETTEP.htm