

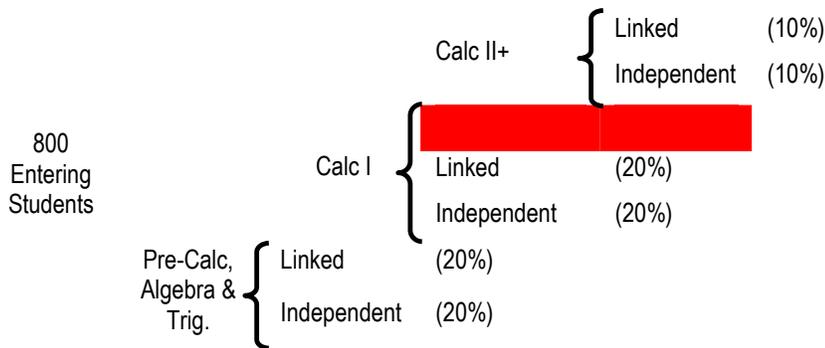


## First-Year Engineering at Arizona State University

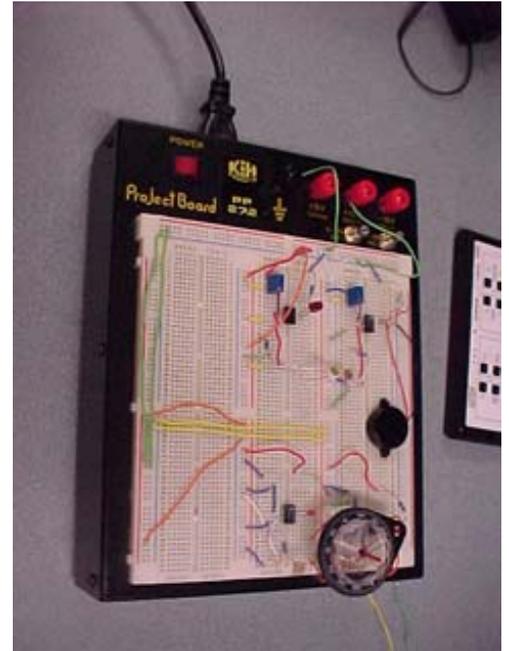
<http://www.foundationcoalition.org>

### EnGAGE: Organizing the Entire First-Year Experience

There are three tracks in the first year engineering program at Arizona State University: 1) An independent path for students who select their own custom program of study, 2) A linked program, in which students choose three courses from a menu and take these courses as a cohort, and 3) an integrated path in which the students take a year long program that combines four introductory courses in a tightly coupled approach. The following chart shows the approximate distribution of the incoming students among the various options.



The linked and integrated tracks comprise the EnGAGE (Engineering Groups for Academic Growth and Excellence) program at ASU, and are specially designed to enhance the students' chances for academic and career success. The EnGAGE2 program places students in groups that take three classes together. We know that students who take courses together find a variety of ways to share the experience and help one another succeed. The students can choose three course clusters from a list of twelve math, chemistry, physics, English, and engineering classes.



An operational amplifier project built by a freshman team in the EnGAGE1 program

### FIPE: Freshman Integrated Program in Engineering

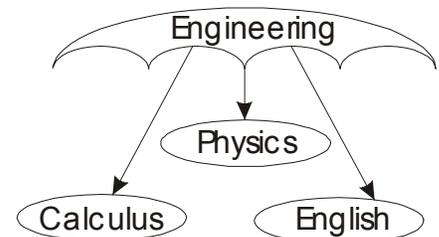
The innovative integrated track, FIPE, aka EnGAGE1, is the flagship program of the Foundation Coalition efforts at ASU. The features of this program enable the student to:

- Take the beginning engineering design, physics, calculus, and English classes in an interactive, integrated block of courses
- Learn in a mediated classroom, equipped with computers and other special equipment, along with the latest in software for mathematics, engineering modeling, data capture, etc.
- Form cooperative learning teams that employ active learning strategies to enhance the learning environment.

The FIPE program is designed for students who have a strong desire to learn and who welcome the opportunity to take an active role in their own education. Students with these desires will find that a supportive, encouraging, and interesting learning environment and/or experience awaits them.

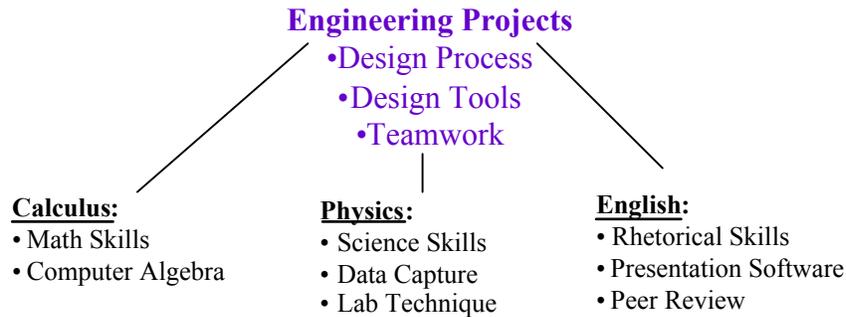
### Role of Engineering

The overarching plan of the FIPE program is to develop students who understand the underlying principles in the four subjects and how these subjects relate to one another. In brief, engineering is treated as the "umbrella" that supports and is supported by the other three topics. This is shown pictorially as:



## Projects: The Critical Integrative Element

Understanding how the four courses are integrated is the main learning objective of the FIPE program and is accomplished by making the engineering design class a project-oriented course. During the one-year program, the students design, test, analyze, build, and validate several engineering projects that are based on the physics and calculus they are currently learning.



The design project topics in the first semester have a mechanics orientation and have included:

- A catapult made from an Erector Set
- A trebuchet, also made from an Erector Set

In the second semester, the projects involve electronics and have included:

- Sensors made from operational amplifiers
- An analog computer, also made from operational amplifiers

Please explore the Spring 2001 FIPE website ([www.eas.asu.edu/~roedel/ece194s01](http://www.eas.asu.edu/~roedel/ece194s01)) to see student projects and web pages.

## Compelling Results

ASU has offered the FIPE program since 1994 and the results clearly indicate that students in this program have achieved higher retention rates into the sophomore engineering program over students taking the same courses in the traditional way. At the same time, this program has enhanced students' understanding of the use of computers and the importance of communication skills.

## References for Further Information

1. R.J.Roedel, D.Evans, M.Kawski, B.Doak, M.Politano, S.Duerden, M.Green, J.Kelly, and,"An integrated, project-based, introductory course in calculus, physics, English, and engineering," *Proceedings of the Frontiers In Education (FIE) Conference*, November 5, 1996, Salt Lake City, UT
2. R.J.Roedel, D.Evans, R.B.Doak, J.McCarter, S.Duerden, M.Green, and J.Garland "Projects that integrate engineering, physics, calculus, and English in the Foundation Coalition freshman program," *Proceedings of the Frontiers In Education (FIE) Conference*, November 5, 1997, Pittsburgh, PA
3. R. J. Roedel, D.Alee, R.B.Doak, S.Duerden, and J.Garland, "Novel projects that integrate freshman engineering with second semester physics, calculus, and English," *Proceedings of the American Society of Engineering Education (ASEE) Conference*, June 15, 1999, Charlotte, NC

### **For additional information:**

Contact the Foundation Coalition at ASU through this website:

[www.eas.asu.edu/~asufc](http://www.eas.asu.edu/~asufc)

Whether you're just getting started or looking for some additional ideas, the Foundation Coalition would like to help you incorporate student teams into your engineering classes through workshops, web sites, lesson plans, and reading materials. For suggestions on where to start, see our web site at

<http://www.foundationcoalition.org> or contact: Jeffrey Froyd at [froyd@ee.tamu.edu](mailto:froyd@ee.tamu.edu) or 979-845-7574.