The paper analyzes a pool of 77 engineering/computer science students to identify specific "attrition point" or "roadblock" courses. Strong correlations have been identified between specific courses and attrition from the student pool. Intervention techniques are discussed.

Attrition-Point Courses
- Attrition due to low GPA is linked strongly to two specific courses:
  - Grade lower than "B" in Calculus I or in five college calculus courses resulted in 50% dismissal rate due to low GPA.
  - Grade lower than "B" in Physics I also resulted in 50% dismissal rate due to low GPA.
- Grade lower than "B" in both Calculus I and Physics I resulted in 100% dismissal rate due to low GPA.

Notable Causes of Student Attrition in Engineering Programs
- Per Geisinger and Raman:
  1. Unwelcoming academic climate
  2. Conceptual difficulty with core courses
  3. Lack of self-efficacy or self-confidence
  4. Inadequate high school preparation
  5. Insufficient interest or commitment to engineering
  6. Racism or sexism in the field

Overall Goal of the Study
- The research question is: "What is the effect of intrusive intervention on the performance of nominally high-performing SEECS students?"
- Hypothesis: Tutoring will lead to lower grades in Calculus and Physics and thus higher overall GPA and correspondingly higher retention rate.
- Students demonstrating poor class performance are made aware of university resources and may be required to agree to a "plan of action" to address performance issues.
- Plan of action may include mandatory tutoring and/or pairing with personal tutors.

Interventions
- Intrusive advising
  - SEECS faculty members closely and continuously monitor student performance in all core courses
  - This monitoring includes direct communication with students.
- Students demonstrating poor class performance are made aware of university resources and may be required to agree to a "plan of action" to address performance issues.
- Plan of action may include mandatory tutoring and/or pairing with personal tutors.

Student-to-Student Tutoring
- Upper division students are high-performing students through college.
- Upper division students already act as design mentors, but otherwise represent an underutilized resource.
- Junior and Senior Students will be utilized as tutors for Calculus and Physics as required, and may be asked to assist in other courses as appropriate. Mandatory tutoring will be provided to SE ECS students only.

SE ECS Students:
- SE ECS students are normally recruited and admitted as incoming freshmen; Requirements are:
  - Minimum high school GPA of 4.0
  - U.S. Citizen/Permanent resident
  - Declare a major

SE ECS Programmatic Features to Address Attrition
- Selective program that admits only students with proper high school preparation (attrition point 4)
- Welcoming faculty/student community that works collaboratively to perform community-based engineering design (attrition points 1, 3, 5)
- High percentage of women in the program, in comparison to engineering averages; 50% of SE ECS faculty members are women (attrition point 6)

Conclusions:
- SE ECS addresses, in full or in part, five of the six most common causes of STEM attrition noted by Geisinger and Raman.
- The sixth attrition cause, "conceptual difficulty with core courses" will be studied.
- SE ECS-PASS has shown some promise as an effective reinforcement to traditional course delivery for student learning and retention.
- The question to be answered is: will peer-assisted study have a measurable impact on retention for nominally high-performing students?