Summary:

Teaching, Advising, & Recruitment:

- Fall 2008 Undergraduate Enrollment: 96 (4th highest on campus)
- Fall 2008 Enrollment 27.4 students/FTE (2nd highest on campus)
- Fall 2008 Freshmen Enrollment: 36 (3rd highest on campus)
- Fall 2008 Freshmen Enrollment/FTE: 10.3 (highest on campus)

Research:

- Research Proposal Activity / sq ft (last year): $1620 (highest on campus)
- Research Proposal Activity / FTE (last year): $ 0.9 M (3rd highest on campus)

Critical Needs for 2009 (leftover from 2008):

1. Must strategically allocate resources to increase number of faculty in Chemical Engineering as prescribed by ABET in 2005.

2. Must consolidate undergraduate lab space to a location near the faculty as prescribed by ABET in 2005.
Chemical Engineering Program Mission:

The mission of our program is to engage and prepare students for professional careers which require command of the principles of Chemical Engineering. We will focus on the development of complete engineers who can foster innovation through know-how and champion ideas through effective communication. We will deliver a thorough education with insightful teaching, an innovative curriculum, research opportunities, summer job experiences, and channels for permanent, successful careers. All of our efforts are done in the context of providing the human and technical resources critical to enhancing the vitality of the State of New Mexico and the people and businesses that thrive within this region. Like our counterparts in industry, we recognize that achievement of our mission can only be accomplished by continual self-assessment and actions to improve.

Educational Objectives

The following objectives have been established by the program faculty in conjunction with our students and advisors from industry. They describe the characteristics and expected accomplishments of our future alumni.

1. Our graduates will be complete engineers who can: solve problems, experiment, innovate, be resourceful, and champion ideas through effective communication.

2. Our graduates will possess an understanding of the broad reach of a modern Chemical Engineering education and the array of knowledge required to implement solutions which will benefit our society.

3. Our graduates will be engaged in successful careers covering the spectrum of fields which require a command of the principles of Chemical Engineering.

4. Our graduates will benefit from a lifelong love of learning, opening doors to graduate study and enabling graduates to adapt to changes and opportunities in the profession.
Recommended Actions and Ownership for 2009 from IAB meeting:

1. Review of curriculum to address noted weaknesses in transport phenomena and numerical methods. Owner: Faculty

2. Conduct major educational objectives survey of alumni in Summer 2008 and institute an annual survey deployment strategy. Owner: Faculty

3. Conduct exit interview of graduating students to obtain data on educational outcomes and make it an annual event. Owner: Faculty

4. Reach out to alumni and new companies in New Mexico to become involved in the development and direction of the program. Owner: Board/Faculty

5. Carry out plan to increase “bodies” involved with Chemical Engineering students (FTE = 4.0) as outlined in the 2005 ABET Final Statement. Owner Chair/VPAA.

6. Consolidate undergraduate lab space to a location near the faculty offices as outlined in the 2005 ABET Final Statement. Owner Chair/VPAA

7. Re-evaluate methods to incorporate FE Exam scores into department assessment. Owner: Faculty

8. Develop and conduct evaluations of senior design presentations that links to outcomes. Owner: Faculty
Teaching Effectiveness and Loads

The department experienced a record high of 958 undergraduate student credit hours in 2007-2008. Due to the quick hire of Professor Riley, a significant drop in department teaching load, with respect to student credit hours, is not expected. All new faculty, have demonstrated a high degree of effectiveness in the classroom. The overall teaching evaluations have remained constant or increased despite three new faces to the department.

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<th>Name</th>
<th>2002</th>
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<td>Jeon</td>
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<td>930</td>
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<td>Total Undergrad Student Credit Hrs</td>
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<td>Total Graduate Student Credit Hrs</td>
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The past year saw the departure of Professor Weinkauf in June of 2008. The department hired Professor Riley in July of 2008 to replace Weinkauf’s teaching duties.
Research Productivity

As a department of three assistant professors active in research, it is difficult to gauge research success based on research expenditures, publications, and numbers of graduate students. Rather a better gauge of research activity for a young department is proposal activity.

In the 2007-2008 school year, the department proposed over $1600 per square foot of department space, which was approximately double the next closest department. One grant accounted for 50% of the proposal dollars requested. If that proposal was left out, chemical engineering would still be among the highest at Tech. To be fair one year is only a snapshot and may not be a clear trend, so it is important to track this number over time as our young faculty develop.

![Graph](image)

**Figure 1.** 2007-2008 proposed research $ per square foot of departmental space allocation for all programs on campus.

Additionally, the department was among the top departments when it came to proposal dollars per faculty member.
Clearly, as a young department the research production is not at a steady state level in terms of research expenditures, graduate credit hours, publications, etc. Our young faculty have shown that they are committed to contributing a heavy research presence to the Tech community despite the purely undergraduate nature of our program.
Enrollment:

The Chemical Engineering Program has revamped the recruiting presentation we give to groups of visitors for large campus tours and/or sponsored visits. We have continued to offer the Summer Mini-Course with an alternative energy theme. We have also offered an introduction to chemical engineering course, which we expect to improve our retention rates.

In fall 2008, Chemical Engineering attracted 36 new freshmen, the 3rd highest enrollment among programs on campus. Overall enrollment for fall 2008 was 96, the 4th highest enrollment on campus. With over 10 new students per FTE, the department is clearly doing an effective job at recruiting students to the program.

The Chemical Engineering program continues to be burdened by an unusually high student to faculty ratio. As shown in Figure 3, for the past several years the program has survived with nearly double the student to FTE ratio on campus at 20+. Yet, there has been no additional faculty resources allocated to the department. In fact, the department has the same number of FTE as it did in 1998. If current trends in freshmen enrollment continue or even level off, the department will approach a student to FTE ratio over 30 or approximately three times the school average.

![Figure 3. Undergraduate Enrollments at NMT per FTE](image-url)
Student Learning and Pending Modifications to the Curriculum:

FE Exam Results Review:

The results were reviewed at the fall Industrial Advisory Board Meetings (January 30, 2009). This nationwide standardized exam is administered to roughly 20% of all BS Chemical Engineering graduates annually. Only one other accredited Chemical Engineering program requires its students to take the FE exam. Of the 20% of the Chemical Engineering students who take this exam, roughly 85% pass. The goal established by the NMT Department of Chemical Engineering is a 75% pass rate with all students taking the exam. Presently, our pass rate is decreasing. Efforts are continuing to improve these exam scores as described in the analysis below.

The data below is the NMT Chemical Engineering score minus the national average. The bars show 2 year moving averages for each subject on the exam. From this data, we look for trends in improving or decreasing scores of our students rather than absolute scores. We have noted falling scores in Ethics, Statistics, Mass Transfer, and Process Control. Historically, our scores in Advanced Mathematics have been of concern, but recent trends show that those scores seem to be on the rise.

Numerical Methods have been added to the Kinetics course. We will continue to address Numerical Methods in the course increasing to two lectures focusing on these techniques.

We have already begun to address ethics by including it in our new introductory course, CHE 189. Our goal is to include statistics in our Unit Ops course where the analysis of data will give us the best opportunity to do so. We have continued to discuss a Mass Transfer lab to address on-going concerns in Transport Phenomena. An action item from our IAB meeting is to have all three new faculty review the chemical engineering curriculum to suggest changes. Currently, chemical engineering has one of the highest credit requirements for graduation, so simply adding a mass transfer lab or moving process control earlier in the curriculum is much easier said than done. By evaluating the entire curriculum, we should be able to free some credit hours from courses that are not essential and re-allocate them to areas of need.
Figure 4. Two-year moving average of CHE AM FE Exam test scores for chemical engineering students. The national average has been subtracted from the Tech average.

Figure 5. Two-year moving average of CHE PM FE Exam test scores for chemical engineering students. The national average has been subtracted from the Tech average.
Figure 6. Two-year moving average of GEN PM FE Exam test scores for chemical engineering students. The national average has been subtracted from the Tech average.