STRATEGIC ASSESSMENT OF MECHANICAL ENGINEERING GRADUATE PROGRAM

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MISSION:

The mission of the Department of Mechanical and Industrial Engineering is to provide an education that builds within students a solid foundation in mechanical and industrial engineering principles, expands the reasoning, communication and problem solving abilities of students, and prepares graduates who have the motivation and ability for lifelong growth in their professional careers; and to develop and maintain a world-class research program in selected focus areas within mechanical and industrial engineering that complements the educational mission and addresses the evolving needs of industry and society.

The goal of the Mechanical Engineering Graduate Program at both the M.S. and PhD levels is to educate students in the disciplines of Mechanical Engineering, in more depth and breadth than is possible at the B.S. level. This preparation will allow the graduate to utilize contemporary methods at an advanced level during a professional career in practicing engineering, teaching, or research. Each student's plan of study is based on her/his background and career objectives as well as on sound academic practice. The Mechanical Engineering Program faculty members have teaching and research expertise in areas related to fluids engineering, thermal sciences, solid mechanics, and mechanical systems.

ADMISSION PROCESSES AND CRITERIA:

Students who have earned a B.S. or a M.S. degree in an engineering curriculum or a curriculum in the mathematical or physical sciences are eligible to be considered for admission to the graduate program in Mechanical Engineering. In order to be considered for regular admission, the student must have a minimum GPA of 3.00 on a 4.00 scale on all previous college-level work and minimum Graduate Record Examination (GRE) scores of 500 Verbal, 750 Quantitative, and 4.5 Analytical Writing. A minimum Test of English as a Foreign Language (TOEFL) score of 550 (equivalent to 213 in on-line version) may be substituted for the GRE Verbal requirement for students whose native language is not English.

Students may, under exceptional circumstances, be considered for conditional admission with lesser GPA and/or GRE or TOEFL scores. The student with conditional status must achieve regular status within one semester (excluding summer sessions) after admission. To satisfy this requirement, the conditionally admitted student must attain a GPA of at least 3.00 on an initial registration of nine semester hours at The University of Iowa. Students who have not submitted their GRE and/or TOEFL scores by the end of the first regular semester after admission will have their registration for the subsequent semester canceled by the Graduate College.

Students with a B.S. or M.S. degree in Physics, Chemistry, or Mathematics are encouraged to pursue the graduate program in Mechanical Engineering. These students will work with their advisors to develop a program of study to satisfy the ME degree requirements.
The applications were reviewed by appropriate faculty group of solid mechanics-mechanical systems or thermal-fluids. The selection metrics are (a) GPA, (b) GRE test scores, (c) research and scholarship experience, (d) letters of recommendation. The entering ME graduate students have an average GPA comparable to all students entering the UI Programs, e.g. 3.24 vs. 3.30 for 96-99 Sessions and 3.35 vs. 3.45 for 04-07 Sessions. The GRE test scores of ME graduate students were consistently higher than that of all students in the range of 13.1 % (96-99 Sessions) to 16.8% (01-04 Sessions) for combined V, Q and A scores; and in the range of 9.3% (04-07) to 12.5 % (02-05) for combined V and Q scores. It is also noted that the test scores of our students were consistently higher than that of the national average of all ME graduate students. On diversity counts for the period of 2001 to 2009, 2.8% were minority and 13.7% were woman students.

Student demand remains high even during a time of strong global economy, 2005-2008. The number of applications for ME graduate program annually was 109, 56, 73, 70 and 78 for 2004 through 2008. The selectivity of respective year was 23%, 21%, 54%, 40% and 41%. The high selectivity rates were partially due to high quality applicants who applied for admissions as indicated by the high GRE test scores noted above. The high selectivity rates were also due to the fact that many students were discouraged informally through email discussions with individual faculty. Nor did we encourage students to apply if their interests did not match our program or their test scores and GPA did not meet our admission standards.

Majority of graduate students received graduate assistantship support. Our record of assistantship appointments of the fall semester over 2001-2009 shows an average number of 88.5% of students were appointed with GTA or GRA. The standard deviation was 9.6%; the highest rate of appointments was in Fall 2003 (100%), and the lowest in Fall 2001 (67%). About 30% of the appointments were the teaching assistant appointments. More than two-thirds of the students were on the appointments of external grants and contracts; which suggest that research endeavors strongly support the graduate education and graduate education is the core of our research enterprise. The department faculty has been active in pursuing external grants and contracts. For example, the research expenditures per faculty data placed our faculty near the top of the Big-10+ ME (and second program if applicable) departments as revealed at the group’s annual department chairs/heads meeting in Spring 2009. Success of the external funding enables us to offer competitive stipends, which varied across the ME Program. The funding rates were determined by either the advising faculty member (based on their grant funds) or by the research institute that administered the grant. Research assistantships offered for the fall 2009 ranged from the COGs minimum ($20,258) to $25,364 for a 1/2-time GRA appointment for the calendar year.

**PROGRAM OUTCOMES:**

The PhD enrollment data showed that 75% PhD students completed the PhD study for the period (96-97) through (00-01) and the median time to degree (TTD) was 5.3 years.

Since 2004, only 4 ME graduate students received the Graduate College Dean’s Fellowship or the Graduate College Summer Fellowship. In addition, several students received the University’s GAANN Fellowship (for minority doctorates in areas of national needs), the U.S. DoD, Tau Beta Pi (The Engineering Honor Society), and GEM (The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc.) fellowships.
Our database of initial placements of 90 PhD’s graduated over the period of August 1997 to May 2008 shows all but 12 (13%) reported placements. The breakdown of the placements was about 30% accepted academic positions (e.g., tenure-track faculty, research and post-doc positions), about 40% accepted industry positions, and about 15% accepted positions in government and industry.

PROGRAM CHARACTERISTICS:

The ME graduate enrollments averaged 62.5 students (standard deviation of 6.89) for the period of 2001 through 2009, namely it averages about 5 graduate students per FTE. This number is comparable to that of the comparison group.

Reviewing characteristics of the graduate program, one observes strengths in (a) quality of graduate program (i.e., quality of graduate students and quality of faculty mentorship) as indicated by high graduation rates and reasonable TTD, (b) research excellence as indicated by the high percentage of graduate students supported by external contracts or grants. One also observes weakness in low minority and woman enrollments. On opportunity, the ME graduate program is well positioned to expand its endeavors in interdisciplinary research. Majority of graduate students conducted research through interdisciplinary environments offered by the Center for Computer-Aided Design, and IIHR-Hydroscience and Engineering. The faculty research agenda is well position to pursue research in “big science areas” and prepare our students to contribute to the Grand Challenges identified by the National Academy of Engineering. Specific examples are (a) energy storage to “make solar energy economical”, (b) pure oxygen gasification and combustion to “develop carbon sequestration methods” more cost effective, (c) optimization of farm machinery to reduce fertilizer usage to “manage the nitrogen cycle”, and (d) science-based modeling and simulation of engineering systems as well as humans to “enhance virtual reality”. The threats to the graduate program are (a) competition of high quality PhD students and (b) decrease in funding opportunities.

CONCLUSIONS:

The Department of Mechanical and Industrial Engineering maintains a high quality mechanical engineering graduate program. Quality of the program is also affirmed by the fact that many ME alumni took leadership roles in academic institutions, corporations, and government agencies. The faculty research is aligned well to support the Grand Challenges noted by the National Academy of Engineering. To maintain its competitiveness to recruit, retain and graduate high quality graduate students and to fund student research and scholarship endeavors through external contracts and grants, the ME graduate program should further expand its scope to engage in interdisciplinary research, and to form clusters with colleagues on campus to pursue research in selected Grand Challenges areas.