

2009-2014 Academic Plan

Department of Mechanical Engineering

Mission

The Department of Mechanical Engineering (ME) aspires to provide an excellent educational opportunity for its students, significant and timely world-class research, and service to UW and the community.

Action Items for 2009-2014

I. Undergraduate ME Program

- 1) Obtain the maximum 6-year renewal outcome for the ABET accreditation review in fall 2009.
- 2) Obtain and fill a new technician position to support maintenance and development of UG laboratories, to provide electronics support for both teaching and research, to provide support for the senior design experience, and to act as Safety Officer within the Department.
- 3) Review the appropriateness of all five UG laboratory experiences in ME, and implement upgrades to labs as required.
- 4) Evaluate the availability and quality of the student computing facilities and upgrade as required.
- 5) Consider curricular modifications that implement more design experience into the UG program.
- 6) Consider importance of, and means by which we might increase student experience with computer-aided design (CAD) tools.
- 7) Consider curricular modifications that result in more programming exposure at the freshman or sophomore levels.
- 8) Reward and recognize faculty for leadership in curricular innovation and efforts to revitalize UG laboratories.
- 9) Implement an Energy Conversion Option into the existing ME degree program, which will require teaching of several new ME electives. This option will not require any new resources beyond those required to implement the new ESE degree program discussed below.
- 10) Reinvigorate, through increased faculty support and participation, the Department's two student professional societies of ASME and SAE. Renewing participation in national contests sponsored by ASME and SAE through the senior design experience will enhance the Department's visibility and increase student esprit de corps.
- 11) Maintain program rigor and high expectations such that student performance on the FE exam continues at its present level.

II. New Undergraduate Curricular Issues

- 1) Work with the CEAS, the SER, and Academic Affairs to establish an ABET-accredited program in Energy Systems Engineering (ESE). The program will

- require a minimum of two new faculty with expertise in the thermal sciences to;
- (i) teach the new courses that have been proposed, (ii) provide academic advising to students in the program, (iii) monitor and contribute to the program's evolution, and (iv) conduct research in appropriate energy-related areas.
 - 2) Revise the availability of design projects currently offered in ME 4060 and 4070 to support the new ESE program by including more projects related to energy conversion, thermal sciences, and fluid sciences.
 - 3) Work with the CEAS Communications Office and the SER to promote the new ESE program with the goal of matriculating at least 75 UG majors by 2014.
 - 4) Consider a name change for the Department, assuming the ESE program is approved.
 - 5) Consider development of a service course for non-engineers on energy and its conversion, with a focus on renewable energy and future clean-energy approaches. Such a course would increase the CEAS' visibility and provide a quid-pro-quo to the SENR for its accommodation of new ESE students.

III. Graduate Program

- 1) Work with the CEAS Dean's Office, the WERC, and the Outreach School to implement a multi-disciplinary MS degree in Wind Energy Engineering.
- 2) Provide leadership and continue work to establish an interdisciplinary minor in Computational Science at the graduate level, consistent with the vision of UP II. The Department has continued to build strength in this area with its most recent new hire, a computational fluid dynamicist who will join the faculty in July 2009 .
- 3) Increase graduate student enrollments, with a goal of 28 MS and 17 PhD students in the program by 2014. New financial incentives to attract Plan B MS students should be considered, as well as approaches to shorten time-to-graduation for Plan B students, both of which would help make the program more attractive when recruiting students.

IV. Research and Service

- 1) Expand research programs and faculty resources in two areas of existing Departmental strength: materials engineering and computational fluid dynamics. Both areas were identified in UP II as warranting development at UW, and these topics are central to the discipline of Mechanical Engineering. The Department has a very substantial infrastructure in place to support materials science and technology due to our long history of research in composite materials, and we have three faculty members with materials science expertise at the present time. The Department also has world-class expertise and substantial infra-structure in place to support computational fluid dynamics, and the infrastructure will grow substantially with the completion of the new NSF/NCAR facility.
- 2) Implement a 2+1 teaching load for research-active faculty to facilitate increased research productivity.
- 3) Improve national visibility of the Department through increased participation on conference-organizing and professional-society committees.
- 4) Increase the level of external funding to \$1.6M per year by 2014.
- 5) Continue recent increases in the number of archival journal publications published each year, with a goal of 1.5 papers/faculty/year.

- 6) Consider the merits of a formal mentoring system for faculty who are new to academic careers.

Implementation

Consideration and implementation of most of the action items listed above will require a steady and consistent approach over the five-year period encompassing UP III. However, the Department is poised to move forward quickly with the new Energy Systems Engineering program. With formal approval by the UW trustees in January 2009, the Department and the CEAS are prepared to heavily advertise the program in the spring 2009 and implement it for the fall 2009 semester. Since junior-level engineering students could switch to the new program with few academic credits lost, the program’s first graduates could be expected 2-3 years after the program start date.

For the ESE program to reach full viability and provide the coursework that has been proposed, two additional faculty positions in the thermal sciences would be required. The Energy Conversion Option for the existing ME degree will not be feasible to implement unless/until the Department receives the two thermal science positions because student surveys have shown that there will be a high demand for the newly-proposed courses to be offered under that option. The Department requires a laboratory technician to support both UG and research laboratories, and it will only be feasible to develop one of the proposed ESE laboratory-oriented courses (on internal combustion engines) when such a position becomes available.

APPENDIX

Selected Metrics for ME Department

Because values can vary significantly from year-to-year, two-year averages are tabulated as a more appropriate measure of true change.

Performance metric	2002-03 avg	2006-07 avg	2014 Goal
Total UG majors in Dept. ¹	244	260 (+7%)	300 (+15%)
MS Student Enrollment ¹	14.5	16 (+10%)	28 (+75%)
PhD Student Enrollment ¹	6.5	13 (+100%)	17 (+30%)
Total T/TT faculty + APL ¹	13	11.5 (-11%)	16 (+40%)
Total studs/(T/TT fac +APL) ¹	20.4	25.1 (+23%)	21.5 (-15%)
Journal articles/faculty/yr ²	0.8	1.3 (+62%)	1.5 (+15%)
Research Expenditures/FY ³	\$660k	1.14M (+72%)	1.6M (+40%)

¹ OIA data

² ME Dept data: conference proceedings and contributions by Department’s APL are not included in this tabulation.

³ CEAS Dean’s Office data

Progress on Action Items for 2004-09

I. UG Program Issues

- Contribute to goals of college-wide Hewlett effortdone, with at least three ME faculty having made contributions.
- Monitor/document success of new 128 hr programdone, with the 10-year pass rate of 96% for ME students on the *NCEES-Fundamentals of Engineering Exam* unchanged.
- Involve 10% of UGs in researchdone, meeting goal.
- Evaluate computer-based lab instruction for adoption into curriculumdone, but not adopted.
- All faculty to attend teaching workshopsnot done, and little-to-no progress.
- Develop international relations and UG international programdone; UG program has one graduate and 5-10 students currently enrolled, and faculty have established links with schools in Japan, Germany, and Sweden.

II. Graduate Program Issues

- Consider/implement a Plan B MS programdone, with one graduate and 3 students currently enrolled.
- Develop interdisciplinary materials research programdone, but stalled somewhat due to Buttry leaving UW, Kouris NSF appointment, and Armstrong's death. However, a new faculty member with materials science expertise joined the Department in fall 2008, so our materials science productivity will be increasing soon.
- Increase PhD student enrollment to 15 and MS enrollment to 20 by 2009at or slightly behind goal; currently Department has 12 PhD and 19 MS students (note: 3 PhD students have graduated in 2008).
- Travel to recruit graduate studentsdone, with success; travel to Sweden has resulted in 2 PhD students and Japanese interaction has resulted in 2 MS students. Overall recruitment of high-caliber graduate students has improved as evidenced by new PhD student from Stanford and 3 new PhD students from Georgia Tech.

III. Research Goals

- Develop collaborative relationships across campusdone, with success in math, materials science, and computational sciences.
- Increase archival publicationsdone; see table of metrics below.
- PhD degrees should result in archival publicationsdone; for the 6 PhD students graduated between 2004 and the summer 2008, the average number of journal papers published or under review is 3.0 papers/student.
- Increase the level of research fundingdone; see table of metrics below.

- Increase visibility through technical meetingsdone; with increased research productivity (documented in terms of number of publications and research expenditures) has come an increased number of conference papers and conference organizational responsibilities.