Aerospace Engineering and Mechanics Graduate Learning Goals and Outcomes

0) Program Overview

The Aerospace Engineering and Mechanics (AEM) graduate program has 17 faculty and 89 graduate students. The department offers the M.S. degree with both a project option (Plan B) and a thesis option (Plan A), and a research-based Ph.D. degree. The department is currently in the process of replacing its Masters of Aerospace Engineering degree with a coursework only M.S. degree (Plan C). The goals of the graduate program are to train Masters’ students to achieve success towards a career in industry and PhD students to achieve success towards a research-based career in academia or industry. Because of the strong research interests of the faculty there is an emphasis on graduate work at the PhD level.

Research in the department is conducted in the broad areas of fluid mechanics, solid mechanics and mechanics of materials, and aerospace systems. There are a wide variety of research projects encompassed by these general areas. Quality of the research is high. In the 2010 National Research Council rankings, the Doctoral Program in the AEM Department was placed fourth in the nation. The program was ranked 11th in the latest US News and World Report, out of 53 programs.

1) Process by which goals and outcomes were identified

Graduate program goals and outcomes were identified by the faculty and current graduate students. An initial request was sent by the Director of Graduate Studies (DGS) asking faculty and students for thoughts on graduate learning and what the goals should be, what the department was doing well to achieve these goals and assess whether they were being attained, and what could be done better in these areas. The DGS then had meetings with smaller groups of faculty as well as meetings with interested groups of graduate students. The DGS also met with staff, including the DGS Assistant, to discuss possible ways to realistically implement assessment tools.

At this point the DGS drafted a two-page document that was sent to faculty and graduate students for comment. The DGS had a meeting open to all graduate students to solicit further comments. A second draft was distributed to faculty and graduate students by e-mail and discussed at a meeting of the entire faculty. This led to the final draft, which will be voted on at an upcoming faculty meeting.

Going forward, the discussion will be broadened to include AEM’s Industrial Advisory Board, which includes both employers and alumni.

2) AEM Graduate Learning Outcomes

Faculty and graduate students identified the following learning outcomes: (1) knowledge and scholarship; (2) intellectual curiosity; (3) communication skills; and (4) ability to work in a group/team. Success at these outcomes leads to the measurable goals of research productivity and jobs. Knowledge and scholarship was identified as the most important outcome, as it relates
directly to graduate level coursework and research productivity. Intellectual curiosity is fundamental to producing graduates with the ability to work and think independently. Communication skills and teamwork affect scholarship through research presentations at national and international meetings, and are also critical to job performance in a variety of settings.

Graduate students felt that it was important to have a set of learning outcomes for the department. However, they also believed that they have full ownership of their personal goals and outcomes. Faculty and students agreed that these outcomes are relevant for students pursuing either an M.S. or Ph.D. degree, and for students who find either academic or non-academic jobs.

3) AEM Assessment Processes

The learning outcomes are associated with research productivity, which is primarily assessed through publications in archival journals and presentations at national and international meetings. The department also has a series of examinations that the faculty use to track progress towards research productivity. Students seeking a Ph.D. must pass a Written Preliminary Examination (WPE) given in the spring of their first year. Students have two opportunities to pass the exam. Discussion of the WPE results includes the students’ grades and classroom performance up to the exam. Once a student is admitted to the Ph.D. program, he/she must then pass an Oral Preliminary Examination (OPE) about two years after the WPE. This exam consists of a presentation on the student’s proposed research followed by questions both on that research as well as general topics in aerospace engineering and/or mechanics. There are final oral defenses for both M.S. and Ph.D. degrees.

AEM also tracks and assesses student progress through annual self-evaluation process. This process reflects the belief that the primary assessment of graduate student learning outcomes occurs between student and adviser, with input from their M.S and/or Ph.D. committee. Each graduate student is asked to evaluate their progress and to list any major milestones from the previous year and goals for the next year. The student then shares this document with his/her research adviser, who adds his/her evaluation. Student and adviser then meet to discuss the evaluation and sign off on the document. Most graduate students report far more frequent meetings with their adviser than this yearly evaluation requires. However, the formal reviews also help identify problems between faculty and students and help the DGS identify students who are not making sufficient progress towards their degree.

4) Summary

Graduate learning outcomes are more individualized and personal than undergraduate learning outcomes. Students come to graduate school for many different reasons, and it is important for them to be able to set a learning path -- in both coursework and research -- that reflects those reasons. The graduate education model of highly individualized instruction and interaction is well suited to this. While some departmental assessment process is needed to monitor student progress, the primary responsibility is much more on individual students and faculty than in undergraduate education.