

Report of the Engineering Physics Program Advisory Board to the Department of Physics of New Mexico State University. March, 2005

The Engineering Physics Advisory Board (EPAB) met for the second time on Friday March 18th 2005, in Gardiner Hall on the NMSU Main Campus in Las Cruces, New Mexico. In attendance for the EPAB were: Dr. James McNeil, Professor and Head of the Physics Department, Colorado School of Mines; Dr. Robert Sanderson, representing the High-Tech Consortium of Southern New Mexico; Dr. James Small, Special Programs Director, Raytheon Corp.; Mr. John Schaub, B.S.E.P., NMSU 2004; Mr. Jon Haas, Operations Director, Hypervelocity Impact Testing, NASA, Johnson Space Center, White Sands Test Facility (Chair of the EPAB). Absent were Dr. Dennis Buss, Texas Instruments, and Dr. Demetris Agrotis, Delphi Corp.

The primary focus of the Friday session was to update the board to the status of the program's progress in preparing for ABET accreditation. The EP Program Steering Committee (Prof. Gary Kyle, Physics Department Chair; Dr. Don Bix, Vice Provost for Research and Director of NMSU's Physical Science Laboratory; Dr. Mike DeAntonio, college Assistant Professor; Prof. Tom Hearn, Professor of Geophysics, Profs. Steve Pate and Heinz Nakotte, Department of Physics; Prof. Paul Futh, Department of Electrical and Computer Engineering, and Prof. Ron Pederson, Department of Mechanical Engineering) was present for the morning sessions as well as several other faculty of the Physics Department.

Prof. Kyle gave an overview of the role of the EBAP and information about the Physics Department and the EP Program. This was followed by presentations from Profs. Paul Furth and Ron Pederson. The board discussed several items with the Local Committee including the need for greater institutional support for the EP Program as it grows and pursues ABET accreditation. The fact that EP graduates are highly desirable as graduate students in both Physics and Engineering programs was acknowledged by both NMSU and Colorado School of Mines representatives. Additionally, a discussion of constituencies served by the program took place. The NMSU EP Program is still seeking to increase its constituent feedback and representation on the advisory board. Graduate schools are seen as a strongly served constituency. The high value of the EP graduate to industry was uniformly agreed.

Prof. Tom Hearn gave an overview of the BSEP program including a discussion of the current curriculum. An important discussion point was that advising may need a stronger engineering component performed by the engineering faculty. Most of the advising is currently performed within the physics department. An additional discussion took place on recruitment strategies. Strategies for improved on-campus recruitment of new, possibly undecided, students were discussed as well as direct physics participation in recruitment fairs which have been successful at the Colorado School of Mines.

Prof. Steve Pate updated the board on the accreditation efforts. The use of course-specific notebooks to document raw data on courses was discussed (and encouraged). Several items, addressed below in the recommendations section, were also discussed during this session. These include: The adoption of ABET-defined terminology, the importance of documentation of assessment and feedback, engineering faculty support,

capstone courses, student headcount credit and students' interaction with professionals. Construction of the EP program's assessment matrix will be an important milestone in this effort.

The afternoon sessions included meetings with students, faculty and deans of the College of Arts and Sciences (Dean of the Collage, Dr. Waded Cruzado-Salas; Associate Dean for Research, Dr. Robert Czerniak; and Interim Associate Dean for Instruction Dr. Peter Gregware) and from the Engineering College (Associate Dean for Instruction, Dr. William McCarthy). Enthusiasm for the EP program was apparent with all. Students were interested to know more about career options beyond continued graduate study. A plan to involve more representatives from industry during the academic year was discussed with faculty. The board discussed the need for strong commitment to the EP program from the administration for it to succeed. As one of the first inter-college degree programs at NMSU, the EP program suffers from a student head-counting and financial incentive structure that does not fairly reward a shared program such as EP.

Finally, the EPAB met in executive session to review the information it had received and to synthesize its observations and advice. The following constitutes a summary of the board's observations and recommendations.

The board wishes to acknowledge the significant effort put forth by the members of the program steering committee over the past ten months in preparing for the ABET accreditation. Overall, the board is impressed with the quality and dedication of the individuals working to secure this program's future. The program is on the right track.

The board was requested by the Steering Committee to provide feedback in several specific areas. The EPAB's own recommendations also fell within these categories.

1. Choice of constituencies

- a. The list of constituencies originally used by the Colorado School of Mines and initially adopted by NMSU may not be the best choice. CSM is currently condensing their list substantially.
- b. Consider ways of formalizing outreach within the program, both to better acquaint students with career opportunities, and to involve constituencies in the program.
- c. During one morning session, physics and engineering graduate schools were identified as a key constituency served by EP programs. Other suggested constituencies served by EP graduates might include government research labs, selected high tech industries such as the defense industry. Readily available local representatives could be recruited from White Sands Missile Range, NASA, the Army Research Labs, or Los Alamos and Sandia National Laboratories or their contractors.

2. Objectives and outcomes

- a. ABET may have an issue with the written "Objectives" of the program (ref. presentation by S. Pate) which focus almost exclusively on the technical components of the program. Criterion 3 (a-k) also include other "softer" skills which are still nevertheless required for accreditation. As written, these do not portray a clear link to ABET requirements addressing

social, communication, teamwork and professional behavior elements. CSM has attempted to address these with broad program objectives related to communication and professional behaviors. These are then fleshed out in the outcomes.

- b. See also 4a.
- c. Following 1b, Structured interaction of professionals with students may be strongly leveraged to fulfill several standard ABET (a-k) outcomes as well as enhance student socialization.

3. Curriculum

- a. The Math, Science, Humanities and Engineering aspects of the curriculum appear quite good. The board recommends that consideration be given to how the business and financial aspects of engineering practice are covered in the program. Project management under cost and schedule constraints is an important reality most students will eventually face.
- b. Individual course content was not examined by the board; however, there was open discussion on whether certain courses (e.g. E&M) should be taught in Physics or in Engineering. Which would be better for the overall program? Resolution may involve some course redesign. This remains an open item for both the Steering Committee and the EPAB. It should be noted that certain teaching efficiencies can be realized if the cross college accounting can be worked out.
- c. An open issue of discussion is how to best demonstrate (and document) the commitment to ethical behavior within the program and its courses.
- d. Physics faculty should understand the importance of, and participate in, the engineering capstone design courses.

4. Proposed outcomes Assessment methods

- a. Flesh-out the assessment matrix as early as possible. Particularly urgent is the Program portion of the Assessment Matrix. Course feedback appears to be well underway. A recommendation is to start with the EC2000 criteria already existing in the EE and ME departments; what information is already gathered and how is it used?
- b. Someone from the Physics department should attend the upcoming ASEE conference, establish memberships and make connections. Additionally, the Rose Hulman Institute has an upcoming workshop on assessment that may prove valuable.
- c. Documentation and documented follow-up on implemented changes are important to demonstrate closing the loop on both program and course feedback.
- d. Be careful to use the accepted ABET language, definitions and formats when defining outcomes, objectives and assessments criteria and methods.

5. Issues of faculty buy-in and institutional support

- a. The board observed a high-level of faculty buy-in from the physics department and the two engineering department representatives. However the board wonders what the level of faculty buy-in exists with the remaining engineering faculty.
- b. Institutional support in the form of resources and an enabling institutional infrastructure is critical to the success of any interdisciplinary program. A key item communicated to the deans was the need to resolve the cross-

college difficulties associated with funding this program and assigning head-count credit. The EPAB recommends that the deans work to keep these discussions going within the administration.