Date: February 26, 2019

TO: Kareen Fujikawa ABET-EAC Team Chair

FROM: Heinz Nakotte, Interim Department Head, and Chair of the Engineering Physics Program Committee, Department of Physics, New Mexico State University

Subject: 30-day response to ABET-EAC initial review of BS in Engineering Physics

This is the 30-day response to the ABET-EAC initial review for the BS in Engineering Physics program at New Mexico State University. The initial review identified 2 weaknesses, both of which will be addressed in our response below.

It should be noted that our BS in Physics program underwent a separate ABET-ANSAC review at the same time, and the same two weaknesses were identified in their initial review. A 30-day response to ABET-ANSAC for the BS in Physics program was submitted to the ABET-ANSAC Team Chair, Paul Male, on 12/13/2018, and we received a tentative heads-up (by phone) in late January, 2019. To ensure consistent 'ruling' across ABET commissions, relevant portions of Paul Male's feedback are included in this response,

Weakness with respect to Criterion 2 – Educational Objectives

The weakness stated is " This criterion requires the program to have a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of the program educational objectives (PEOs). No documentation was provided to demonstrate that the PEOs have been formally reviewed since the last ABET visit. The program constituents are listed as students, potential employers (Industry, Academia, and Government), faculty and staff, faculty of affiliated engineering programs, alumni, peer institutions that offer engineering physics or similar majors, graduate schools, and citizens of New Mexico. The engineering physics External Advisory Board consists of industry, academia, government, and alumni representatives. It meets periodically and reviews changes to the PEOs. The review process does not involve the citizens of New Mexico, students, and faculty of affiliated engineering programs independently or collectively in the periodic review of the PEOs. Because the program did not provide evidence that the PEOs have been reviewed since the last ABET visit and because not all of the program's constituents are involved in the review process, the program lacks strength of compliance with this criterion.

The current PEOs for the BS in Engineering Physics were formulated in 2012, just prior to the previous ABET-accreditation visit. The Engineering Physics External Advisory Board (EPEAB) played an instrumental role in formulating those PEOs and have continuously reviewed the level of achievement of those PEOs in subsequent visits, as evidenced in the 2014, 2015, 2017 and 2018 EPEAB reports. Dr. Alan Lovell (Chair of EPEAB, 2017-2018) and Mr. Jon Haas (Chair of EPEAB, 2012-2016) provided a memorandum, stating that the EPEAB felt that a formal review of the PEOs was not necessary and they were assumed to be still adequate; see Appendix I. However, to strengthen compliance with this criterion, the upcoming 2019 EPEAB meeting (scheduled on April 12 & 13, 2019) will set aside a time block to review the PEOs.

A formal review of PEOs was also requested by ABET-ANSAC for our BS-Physics program, and the Physics External Advisory Board (PEAB) met on campus on November 9 & 10, 2018, and performed the review. The stated PEOs for the BS in Physics are very similar to the stated PEOs in Engineering Physics. The PEAB suggested only minor phrase changes in the PEOs for the BS in Physics.

The constituency representation and input were also a point of contention for our BS in Physics program. As for BS in Engineering Physics, there were questions about input from students and citizens of New Mexico, which are listed as constituents in both, our EP and our Physics SSRs. In addition, the EP program lists faculty of affiliated engineering programs as constituents. The preliminary ABET report agrees that other constituents are adequately represented on our EPEAB with current members and their affiliations listed in Table 2.4 of our EP SSR.

The three sets of constituents in question are discussed below:

Engineering Physics Students *(to be eliminated)*

Engineering Physics students and the Society of Engineering Physics (SEPh) students meet with the EPEAB separately for a one- or two-hour time block during their site visit and therefore provide important program feedback through that avenue. Even though there are some benefits to having a formal student member on the EPEAB, current students may have a conflict of interest when it comes to more sensitive discussions about a program's health and directions, taking into account employer's needs. Because of the potential conflict of interest, we propose to eliminate current EP students from the list of constituents for the EP program.

Citizens of New Mexico *(to be eliminated)*

Several of the EPEAB members are also citizens of New Mexico. Nevertheless, this group should not be listed as constituents of individual programs, although they are certainly constituents of the university as a whole (being a state university). Therefore, we propose to also eliminate this group from our list of constituents.

Faculty of Affiliated Engineering Programs *(provides input through EP Program Committee)*

As is the case for faculty from the Department of Physics, faculty from affiliated engineering programs (i.e. Aerospace & Mechanical, Chemical & Materials, Electrical & Computer Engineering) are not represented on the EPEAB, which consists strictly of external (non-NMSU) members, as the name suggests. However, the local EP Program Committee, which administers the EP program, has had faculty representation from all above affiliated engineering programs, since the program was EP program was started in 2004. As listed in our SSR, the current EP Program Committee members from affiliated engineering programs are Drs Fangjan Shu (Aerospace & Mechanical Engineering), Hongmei Luo (Chemical & Materials Engineering) and Steve Stochaj, Electrical & Computer Engineering). These members regularly participate in the EP Program Committee meetings, where all aspects of the EP program (including Program Educational Objectives) are discussed on a regular basis. If needed, they will raise any issues with colleagues in their respective departments.

Above response to the weakness in Criterion 2 (periodic review of PEOs and constituency representation on the advisory board) is very similar to our 30-day ABET-ANSAC response for our BS in Physics, submitted in December 2018. In late January 2019, the ABET-ANSAC Chair, Paul Male, stated that he and the PEVs now recommend that this weakness be completely removed, given the follow-up actions by our program.

Weakness with respect to Criterion 4 - Continuous Improvement

The weakness stated is "This program requires that the program regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. Current assessment methods for the program combine results for multiple engineering program into single assessment results for some of the student outcomes.

Thus it is not possible to determine the extent to which the engineering physics are attaining some of the student outcomes. This results in decisions for continuous improvement with may not benefit engineering physics students. Thus, strength of compliance with this criterion is lacking."

We admit this has been our method for the entire history of our Engineering Physics program, which was continuously accredited by ABET-EAC since 2007. Until this past ABET visit, we had not gotten any indication that this process would be inadequate. Evaluating achievement of individual Program Outcomes in courses overall, regardless of the actual majors of enrolled students, was also favored because the number of our BS in Engineering Physics students is small. In fact, it is probably the smallest program in NMSU's College of Engineering, with a total enrollment of only ~30 students currently (all levels). Therefore, the BS in Engineering Physics enrollment in almost all physics courses is very low, anywhere between 1 and 10 BS in Engineering Physics students per course. Subsequently, Program-outcomes achievement measurements in physics courses using a small student group may be questionable, due to the preparedness of individual students of that group.

Nevertheless, to address this weakness, we have revised our "Post Instruction Comment Form" that instructors use at the end of each semester to record assessment data. In addition to Program-Outcomes assessment table for the whole course, the revised form now includes two additional tables that provides separate performance reports for both physics programs seeking ABET accreditation, the BS in Engineering Physics (EAC) and BS in Physics (ANSAC); see Appendix II.

The 'new' Post Instruction Comment Form was first used in Fall of 2018, and the results are provided in the table on the next page. Except failure in achieving Program Outcome (k) – Technical Know-How and some weaknesses in Program Outcomes (e) – Problem Solving, (i) – Life-Long Learning and (j) – Contemporary Issues, our current EP students generally seem to achieve the stated Program Outcomes targets, although this evaluation is based on fairly small numbers so far. A second set of Program Outcomes measures will be available in early summer of 2019, after the conclusion of the Spring of 2019 semester. We will continue to use this process from now on, and it should address this weakness in the upcoming years.

The Fall 2018 data were not yet available at the time when we submitted our 30-day response on the BS in Physics to ABET-ANSAC. Even so, in his late-January heads-up, Paul Male indicated that he and the PEVs approve our proposed process, but that it would remain a weakness for the BS in Physics ANSAC accreditation until we provide the complete data sets for Fall 2018 and Spring 2019. Once that is done, it would be likely reduced to only a concern.

Program Outcomes Course Assessment - Fall 2018 Physics Courses						
Course	No. of EP enrolled	met target	partly met target	did not meet target	did not complete assignment	% of EP who met / partly met target
PHYS 213	4	3	0	1		94% / 94%
PHYS 215G	1	1	0	0		
PHYS 216G	3	3	0	0		
PHYS 217	8	8	0	0		
PHYS 305V	1	1	0	0		
Outcome b						
PHYS 213L	3	3	0	0		100% / 100%
PHYS 215GL	1	1	0	0		
PHYS 217L	8	5	0	3		
Outcome c						
PHYS 217L	8	8	0	0		100% / 100%
Outcome d						
PHYS 217L	8	8	0	0		100% / 100%
Outcome e						
PHYS451	7	2	2	0	3	50% / 80%
PHYS 461	6	3	1	2		
Outcome f						
PHYS451	7	7	0	1		85% / 92%
PHYS 461	6	4	1	1		
Outcome g						
PHYS 217L	8	8	0	0		100% / 100%
Outcome h						
PHYS451	7	5	0	0	2	82% / 82%
PHYS 461	6	4	0	2		
Outcome i						
PHYS451	7	2	3	0	2	63% / 100%
PHYS 461	6	5	1	0		
Outcome j						
PHYS451	7	2	3	0	2	50% / 80%
PHYS 461	6	5	1	0		
Outcome k						
PHYS 395	4	0	1	3		0% /25%

Appendix I

MEMORANDUM

TO: Karen Fujikawa, ABET EAC Chair

FROM: Dr Alan Lovell and Mr Jon Haas

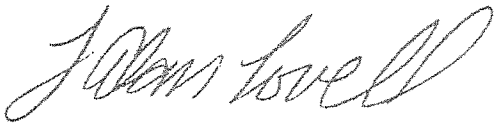
DATE: February 22, 2019

SUBJECT: Response regarding Engineering Physics - Program Educational Objectives

The Engineering Physics (EP) Program at New Mexico State University has three Program Educational Objectives (PEOs), namely: (1) Competitiveness, (2) Adaptability, (3) Teamwork and Leadership, all of which were formulated in 2012 in close consultation with the 2012 Engineering Physics External Advisory Board (EPEAB). These PEOs were defined such that they adequately represent the needs and expectations of potential employers of EP graduates.

The EPEAB met in 2014, 2016, 2017 and 2018, and aside from reviewing the achievement of Program Educational Objectives, the EPEAB is also tasked to perform a general review on whether the EP program continues to serve the constituent's needs. In all cases, the EPEAB concluded that this was the case. The EPEAB took this as evidence that a review of EP PEOs was not necessary. Any indications that EP alumni would be ill-prepared for their chosen careers would have triggered a review of current PEOs for EP.

To comply with ABET's expectations of a periodic formal review, the EPEAB plans to discuss the adequacy of the PEOs in its 2019 EPEAB meeting, which is scheduled on April 12 and 13, 2019. The results of the discussions should be available soon thereafter.



Thomas Alan Lovell, Ph.D.

Chair, NMSU Engineering Physics External Advisory Board, 2017-2018

Jon Haas

Chair, NMSU Engineering Physics External Advisory Board, 2012-2016

Post-Course Instructor Comment Form

Course: _____

☐ lecture course ☐ instructional laboratory ☐ other, specify _____

Semester: _____

Instructor: _____

Estimated average class attendance (in %, after drop date): _____

Final Grade Distribution:

A	B	C	D	F	withdrawn	incomplete	**average grade**
___	___	___	___	___	___	___	___

A. Grade Basis (check all that apply)

☐ **tests and exams**

How many? _____

☐ take-home ☐ in class

☐ **homework**

How many assignments? _____

☐ written ☐ on-line, using _____

☐ from textbook ☐ other sources ☐ own problems

☐ **quizzes**

How many? _____

☐ announced ☐ unannounced

☐ written ☐ oral

☐ **projects/reports/essays**

How many (per student)? _____

☐ written ☐ oral

☐ individual ☐ group, how many group members? ____

☐ course material ☐ related material

☐ other, specify: _____

☐ **class participation/attendance**

☐ attendance list

☐ in-class participation; how measured? _____

☐ other, specify: _____

☐ **other**, specify: _____

B. Textbook

Textbook used: _____

Chapters covered: _____

- Considering the educational goals of this course, the textbook provides a _____*(fill in)*_____ foundation of the material to be taught.

☐ complete and comprehensive ☐ solid ☐ adequate ☐ marginal ☐ poor

- For future courses, the use of this textbook is:

☐ recommended ☐ recommend with reservations ☐ not recommended.

- List main deficiencies of the textbook (if any):

_____

_____

_____

C. Teaching Strategies (check all that apply)

Lecture sequence:

☐ followed textbook ☐ followed textbook, but provided supplementary material

☐ used my own sequence ☐ did not use the book, because _____

Lecture Style:

☐ chalk board ☐ power point ☐ overhead slides

☐ other (e.g. movies), specify: _____

In-class learning tools:

☐ in-class demonstrations ☐ instant feedback tools

How often? _____ ☐ clickers ☐ flash cards ☐ other, specify: _____

Involving students? yes / no

☐ group work, specify: _____

Hand-Outs:

☐ lecture notes ☐ supplementary material ☐ homework solutions ☐ test/exam solutions

☐ other, specify: _____

D. Program outcomes

Pre- (and Post-) Test(s)

There are two agreed ways to measure the learning progress of EP students: a) a single pre-test designed to test the student's knowledge of the pre-requisite course or b) a pre- and posttest to determine the students knowledge before and after instruction.

Test	**Measuring Tool** (FCI, standardized test, etc.)	**Target**[a] (in %)	**Result** (in %)	**Number of Students Exceeding Target** (in %)
Pretest				
Posttest (if applicable)				

[a]: The target is given by: ☐ national average ☐ department avg. over last __ years plus 5%
☐ other, specify: _____

Measuring specific ABET program outcomes

The ABET-style course syllabus dictates that each course is required to independently measure one or several of the EP program outcomes (a-k). The final course grade is not an acceptable measure, thus you need to specify what has been used as an independent measure. In case you measured other ABET outcomes as well, feel free to include them as well, but mark them with an asterisk (*).

Program Outcomes	**Measuring Tool** (GRE, skill-building homeworks, etc.)	**Target**[a] (in %)	**Result** (in %)	**Number of Students Exceeding Target** (in %)

[a]: The target is given by: ☐ national average ☐ department avg. over last __ years plus 5%
☐ other, specify: _____

BS in Physics majors – Program Outcome Findings

Instructions:

- Students who meet or exceed target listed in the previous section are counted as 'met target',
- Students who get within 20% of the target (i.e. 0.8*T) are counted as 'partly meets target';
- Students who score below 20% of the target value are counted as 'did not meet target'.
- *Example: Let's say there were 10 BS-Physics students and the target was 80%. If 6 students had a score of 80% or more, 3 students had between 64 % and 80%, and 1 student had below 64%, the row should list: 6 – met target, 3 – partly met target, 1 – did not meet target.*

Total Number of BS-Physics Students enrolled in the course:_____			
Program Outcome	**Met target**	**Partly met target**	**Did not meet target**

BS in Engineering Physics majors – Program Outcome Findings

Instructions: *see above*

Total Number of BS-Engineering Physics Students enrolled in the course:_____			
Program Outcome	**Met target**	**Partly met target**	**Did not meet target**

E. Instructor's comments

Summarize the ***main deficiencies*** that you have identified:

1. _____
2. _____
3. _____

F. Instructor's suggestions for future course

List some possible improvements, necessary changes, suggestions and useful teaching strategies for the course in future:

1. _____
2. _____
3. _____

G. Course improvements

List changes made in response to past instructor suggestions:

1. _____
2. _____
3. _____