Engineering Physics Program

(Bachelor of Science in Engineering Physics)

at

New Mexico State University

APPENDIX E. SUPPLEMEBTARY DOCUMENTS

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A	B	C	D	F	withdrawn	incomplete	**average grade**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

□ course material □ related material

□ other, specify: _____

□ **projects/reports/essays**

How many (per student)? _____

□ written □ oral

□ individual □ group, how many group members? ____

□ **class participation/attendance**

□ attendance list

□ in-class participation; how measured? _____

□ other, specify: _____

□ **other**, specify: _____

B. Textbook

Textbook used: _____

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: _____

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. _____

Senior-Student Exit Interview Form

Engineering Physics
Senior Exit Interview

Student Name: Interviewer:

1. Which Engineering Physics option?		
2. Which would you rather do upon graduation?	A. Full-Time Employment	B. Full-Time Graduate School

A. If **Full-time Employment:**

3. How many interviews did you schedule through Placement and Career for full-time employment?						
4. How many on-site interviews for full-time employment did you go on?						
5. How many job offers for full-time employment did you receive?						
6. For the offer that you think you will accept please tell us:						
a. Company Name:						
b. Location:						
c. Job title:						
d. Starting Salary Range (e.g., $40,000-$45,000)						
e. Level of Enthusiasm for this job. (5 = highest)	1	2	3	4	5	

B. If **Full-Time Graduate School:**

7. From how many graduate programs did you obtain information?						
8. To how many graduate programs did you apply?						
9. To how many graduate programs were you accepted?						
10. For the graduate program that you think you will attend, please tell us:						
a. School Name:						
b. Location:						
c. Program:						
d. Amount of Initial Support						
e. Level of enthusiasm for this program. (5 = highest)	1	2	3	4	5	
11. How many credit hours did you earn as an NMSU student?						
12. What's your GPA?						
13. How many campus-sponsored career fairs did you attend?						
14. How many co-ops or summer internships did you go on?						

15. Rank on a on a scale of 1 to 4 how well your education at NMSU and/or in the Engineering Physics Program prepared you in each of the following areas
1 =agree, 2=neutral, 3=disagree, 4=not important.

a. Scientific expertise – knowledge of concepts and notation	1	2	3	4
1. Mechanics	1	2	3	4
2. Electricity and Magnetism	1	2	3	4
3. Modern Physics	1	2	3	4
b. Experimental training	1	2	3	4
1. Physics experimental training	1	2	3	4
2. Engineering experimental training	1	2	3	4
3. Electronics training	1	2	3	4
4. Mechanical training	1	2	3	4
c. Design abilities	1	2	3	4
1. Project design	1	2	3	4
2. Project implementation	1	2	3	4
3. Project completion	1	2	3	4
d. Teamwork	1	2	3	4
1. Ability to work within a team	1	2	3	4
2. Ability to lead a team	1	2	3	4
e. Problem solving in Physics and Engineering	1	2	3	4
1. Problem solving in Physics	1	2	3	4
2. Problem solving in Engineering	1	2	3	4
f. Professional responsibilities and ethics	1	2	3	4
g. Communications skills	1	2	3	4
1. Oral communication skills	1	2	3	4
2. Written communication skills	1	2	3	4
h. Societal impact – broader impact of engineering on society	1	2	3	4
i. Lifelong learning	1	2	3	4
1. Preparation for the workplace	1	2	3	4
2. Career development skills	1	2	3	4
3. Ability to learn new skills	1	2	3	4
j. Contemporary knowledge	1	2	3	4
1. up-to-date knowledge of physics	1	2	3	4
2. up-to-date knowledge of engineering	1	2	3	4
k. Technical skills	1	2	3	4
1. Computing skills	1	2	3	4
2. Math skills	1	2	3	4
3. Electronics skills	1	2	3	4
4. Mechanical skills	1	2	3	4
5. Statistics and probability skills	1	2	3	4

Concerning the duration of your stay at New Mexico State University, please answer, where: 1=poor, 2=neutral, 3=great, and 4=not important or doesn't apply:

16. Rate the quality of academic advisement that you received	1	2	3	4
17. Rate the quality of career advisement that you received.	1	2	3	4
18. Did the core classes prepare you for the electives (breadth, depth), and capstone classes?	1	2	3	4
19. Rate the facilities:				
a. Physics Department Computing Facilities:				
1. Hardware	1	2	3	4
2. Software	1	2	3	4
b. Physics Department Laboratory Facilities	1	2	3	4
c. Engineering Facilities	1	2	3	4
c. Chemistry Facilities:	1	2	3	4
d. Classrooms	1	2	3	4

16. In your opinion, what are the top three courses in the EP Program that you took?

a.
b.
c.

17. In your opinion, what are the three weakest courses in the Engineering Physics Program?

a.
b.
c.

17. What motivated you to come to NMSU?

18. What motivated you to major in Engineering Physics?

20. Did you transfer into NMSU?	YES	
	NO	

21. What Math did you start with?	

22. Please provide any additional suggestions for improving the educational experience for future EP students.

23. Are you a member of any professional physics, engineering, or science societies?

For the purposes of keeping contact with you after graduation and sending you our Physics Department Newslettter, we would like information about how to reach you in the future. This information will be kept confidential and will be detached from the survey.

Name	
Graduating Year and Semester	
Address after Graduation	
Phone after Graduation	
Email after Graduation	

Alumni Survey Form

Engineering Physics Alumni Survey

Name Address

Phone E-mail

Year of Graduation in Engineering Physics EP Concentration

Your participation in this survey is voluntary. Answer only those questions you are comfortable with.

1. Are you presently employed?

Yes No

If yes, full time or part time?

Full time Part time

If no, are you presently looking for employment?

If not employed, skip to question 9.

Yes No

2. What is the title of your position?

What is your current salary at this position?

3. Who is your present employer?

4. How long have you worked for your present employer?

5. In your present job, how many individuals do you supervise?

6. How long did it take to find your first position after graduation from NMSU?

Had a position lined up before graduating.

1 month

2-3 months

4-5 months

6 months or longer

7. In your present job, do you participate on any teams, or on any multidisciplinary projects?

Yes No

If yes, what disciplines are represented on these projects or teams?

8. Briefly describe the primary responsibilities of your current job?

9. Did you pursue graduate studies after graduating from NMSU?

Yes No Plan to pursue.

10. How many positions (total of employers and positions with each employer) have you held since graduating from NMSU EP.

Please specify all of your job titles and employers.

11. Thinking about courses you've taken, which course at NMSU was the most useful for your career?

12. Still thinking about courses you've taken, which course at NMSU was the least useful for your career?

13. Which activities, programs or courses (not offered when you attended NMSU) would have better prepared you for the workforce and your career?

14. What are the most significant factors for success in your career?

15. Did the NMSU Engineering Physics Program achieve its Educational Objectives? Please rate the following objectives.

Competitiveness

Graduates are competitive in internationally-recognizes academic and industrial environments.

Strongly agree Agree No opinion

Disagree Strongly disagree

Adaptability

Graduates exhibit success in solving complex technical problems in disciplines subject to quality engineering processes.

Strongly agree Agree No opinion

Disagree Strongly disagree

Teamwork and Leadership

Graduates have a proven ability to function as part of and/or lead interdisciplinary teams.

Strongly agree Agree No opinion

Disagree Strongly disagree

16. I am satisfied with my overall learning experience and preparation from NMSU.

Strongly agree Agree No opinion

Disagree Strongly disagree

17. What professional associations are you a member of?

18. Please list any engineering licenses or certifications that you have received.

Please provide an approximate number of scientific papers, technical reports, manuals or similar that you have published since graduating from NMSU.

Please provide an approximate number of patents that you filed since graduating from NMSU.

Have you received any awards or distinctions since graduating from NMSU? Please list.

Approximately how many continuing education courses, workshops, seminars or other life-long learning activities have you taken since graduating from NMSU?

19. How would you rank your professional preparation in comparison with graduates from other institutions?

Much better Slightly better About equal Slightly worse Much worse

20. What suggestions do you have for the Engineering Physics program to better prepare students for the workplace?

21. Please provide us with the name and contact info (e-mail address preferred) of your current (or a former) supervisor. We might contact them for an independent employer survey of our EP program.

Thank you for taking the time to answer these questions. Your valued input will help the College of Engineering and the Engineering Physics program better shape and implement a productive curriculum for current and future students.

Be sure to stay in touch and Go Aggies!

Example STAR audit [redacted]

BS - Engineering Physics - Mechanical Option

Prepared	06/09/2018	Program	BS-EP/ME	Catalog	2018
Student	[redacted]	Graduation		Job	

Audit

AT LEAST ONE REQUIREMENT HAS NOT BEEN SATISFIED

******* NEW MEXICO STATE UNIVERSITY STAR REPORT ********

This student academic requirements (STAR) report is a planning tool and is not a contract between the student and the university. This report has been designed to assist you with planning courses to complete degree requirements. Every effort has been made to insure its accuracy; however, final confirmation of degree requirements is subject to department, college and university approval. Students must apply for degrees within deadline dates for the semester in which they anticipate to graduate. If you have questions about your degree audit, please contact your academic advisor.

✓ **Minimum Grade Point Average and Credit Hour Requirements Your Bachelor's degree requires a minimum of 129 completed degree hours, a minimum GPA of 2.00 in all course work, and completing at least 30 of the last 36 hours at NMSU.**

✓ **Cumulative grade point average** 3.760 GPA

x **Total degree hours earned. (excludes developmental courses)**

x 121.0 CREDITS IN-P---> 15.0 CREDITS

✓ **Upper-division courses: Student must complete a minimum of 48 hours at or above the 300-level.**

✓ 50.0 CREDITS IN-P---> 15.0 CREDITS

✓ **Residency requirement: At least 30 of the last 36 degree credits must be completed at NMSU.** satisfied

✓ **English Basic Skills Requirement** satisfied

✓ **Mathematics Basic Skills Requirement** satisfied

✓ **General Education Common Core Area I (9-10 Credits) Communications**

✓ Complete three credits of English composition - Level 1 with a grade of C or better

14FA	ENGL111G	3.0	CR	RHETORIC & COMPOSITION I

✓ Complete three credits of English composition - Level 1 with a grade of C or better

EXCEPTION: Allow ENGL112

15SP	ENGL112	3.0	A	COMP & RHET II

✓ Complete three credits of oral communication

15FA	COMM265G	3.0	A	PRNCPLS-HUMAN CMNCTN

✓ **General Education Common Core Area II (3 Credits) Mathematics**

✓ Complete 3/4 credits of college level Mathematics or higher

15FA	MATH191G	4.0	B+	CALCULUS I

✓ **General Education Common Core Area III (8 Credits) Laboratory Sciences**

EXCEPTION: Allow PHYS213; EXCEPTION; Allow PHYS213L

16SP	CHEM111G	4.0	A	GENERAL CHEMISTRY I
15FA	PHYS213	3.0	A	MECHANICS

15FA	PHYS213L	1.0	A	EXPERIMENTAL MECHANICS

✓ **General Education Common Core Areas IV & V (15 credits)**
Social/Behavioral Sciences and Humanities/Fine Arts

✓ Social/Behavioral Sciences

14SP	PSY 201G	3.0	CR	INTRDN-PSYCHOLOGY
15SP	GOVT110G	3.0	CR	INTRDN-POLITICAL SCI

✓ Humanities and Fine Arts.

15FA	HIST102G	3.0	A	MODERN EUROPE
16SP	PHIL100G	3.0	A	PHILOSOPHY, LAW AND ETHICS

✓ Social/Behavioral Sciences/Humanities/Fine Arts.

13FA	SOC 101G	3.0	CR	INTRDRY SOCIOLOGY

✓ **Viewing a Wider World Requirement** ☐

Take six credits at the 300 or 400 level in General Education courses. One of the two courses must be in a college other than your own and outside the major department. *See catalog for list of acceptable courses.

18SP	HON421	3.0	A	SPECIAL TOPICS >> MATCHED AS EDUC317V

x **EP Core Requirements – Courses in this requirement may also meet Common Core requirements. See your advisor.**

✓ **Complete ENGL 111 and 218.**

EXCEPTION: Allow ENGL112

14FA	ENGL111G	3.0	CR	RHETORIC & COMPOSITION I
15SP	ENGL112	3.0	A	COMP & RHET II

✓ **Mathematics Requirement (14 credits) – Complete MATH 191, 192, 291 and 392**

15FA	MATH191G	4.0	B+	CALCULUS I
16SP	MATH192GH	4.0	B+	CALCULUS II HONORS
16FA	MATH291G	3.0	B	CALCULUS III
17SP	MATH392G	3.0	A	INTRO ORD DIFF EQS

✓ **Natural Sciences Requirement (4 credits) – Complete CHEM 111**

16SP	CHEM111G	4.0	A	GENERAL CHEMISTRY I

x **Physics Course Requirement (36 credits)**

15FA	PHYS213	3.0	A	MECHANICS
15FA	PHYS213L	1.0	A	EXPERIMENTAL MECHANICS
16SP	PHYS214	3.0	A-	ELECTRICITY/MAGNETISM
16SP	PHYS214L	1.0	A+	ELECTRICITY/MAGNETISM LAB
16FA	PHYS217	3.0	A	HEAT, LIGHT, AND SOUND
16FA	PHYS217L	1.0	A+	EXP HEAT, LIGHT, AND SOUND
17SP	PHYS315	3.0	A+	MODERN PHYSICS
17SP	PHYS315L	3.0	A	EXPMTL MODERN PHYS
17FA	PHYS395	3.0	A	INTERMEDIATE MATH METHODS
18SP	PHYS454	3.0	IP	INTERM MOD PHYSICS I
18SP	PHYS461	3.0	IP	INTERM ELCT/MAG I

SELECT FROM: PHYS455,462

✓ **Complete PHYS 451 or ME 333.**

17FA	PHYS451	3.0	A	INTRMED MECHANICS I

✓ **Complete 3 additional upper division credits in electives in PHYS and ME.**

18SP	PHYS489	3.0	A	INTRO TO MODRN MATERIALS

x **Mechanical Engineering Requirement (42 credits)**

EXCEPTION: Allow CE233 for ME236

15FA	ENGR100	3.0	A	INTRO TO ENGINEERING
16SP	ME240	3.0	B	THERMODYNAMICS
16FA	ME159	2.0	A+	GRPHCL CMNCTN/DESIGN
16FA	CE233	3.0	A	MECHANICS-STATICS
16FA	ME261	3.0	B+	M E PROBLEM SOLVING
17SP	CE301	3.0	A	MECHANICS-MATERIALS
17SP	ME237	3.0	A	ENGR MECHANICS II
17FA	ME326	3.0	A	MECHANICAL DESIGN
17FA	ME338	3.0	A	FLUID MECHANICS
18SP	ME341	3.0	B-	HEAT TRANSFER
18SP	ME425	3.0	A	DSGN-MACHINE ELEMENTS
18FA	ME345	3.0	IP	EXPRMNTAL METHODS I
18FA	ME426	3.0	IP	DESIGN PROJECT LAB I

SELECT FROM: ME427

Courses in Excess of Specific Requirements

17FA	CHME470	3.0	A+	INTRO TO NUCLEAR ENERGY
18SP	CHME471	3.0	B	HEALTH PHYSICS
18SP	ENGR398	1.0	A+	ENGR LEADERSHIP
17FA	GOVT110G	3.0	A+	AMER NATIONAL GOVT
18FA	GOVT330	3.0	IP	INTRO TO PUBLIC ADMIN
17SP	GOVT366	3.0	A	AMERICAN FOREIGN POLICY
18SP	GOVT391	3.0	A	CONSTITUTIONAL LAW
17SP	PHYS380	1.0	A	INDEPENDENT STUDY

Degree Audit Codes: CR: credit from another institution or advanced placement; IP: in progress

END OF ANALYSIS

Example Faculty Outcomes Summary

Outcomes Assessment Report for Program Outcome (d)
"an ability to function on multidisciplinary teams"
prepared by Boris Kiefer

Summer 2018

Outcome name and description: (d) An ability to function on multidisciplinary teams.

Courses measuring the outcome: PHYS217L, PHYS 315L, PHYS 471, and PHYS 475.

Measurement: Each team performed a peer participation evaluation.

Numerical results and benchmarks of the measurements:

Course	Instructor	Target	Result	Fractional Differential	Measure
PHYS 315L (SP2013)	Pate	4.0	4.0	0	Team participation
PHYS 315L (SP2014)	Pate	4.0	5.0	+25%	Team participation
PHYS 315L (SP2015)	Pate	4.0	3.6	-10%	Team participation
PHYS 315L (SP 2016)	Pate	4.0	3.7	-8%	Team participation
PHYS 315L (SP 2017)	Pate	4.0	3.5	-13%	Team participation
PHYS 315L (SP 2018)	Pate	4.0	3.9	-3%	Team participation
PHYS471 (SP2012)	Zollner and Urquidi	NA	NA	NA	Observation by instructor
PHYS 471 (FA2016)	Zollner	90	100	+11%	Teamwork
PHYS 475L (SP 2015)	Urquidi	90	95	+6%	Group work
PHYS 475L (SP 2016)	Urquidi	75	90	+20%	Group work
PHYS 475L (SP 2017)	Urquidi	75	90	+20%	Group work
PHYS 475L (SP 2018)	Urquidi	75	95	+27%	Group work

Data missing for PHYS217L: FA2013-17: PHYS 475L: SP2013, SP2014.

What curriculum improvements were implemented: loops closed and recommendations.

Recommendations for Curriculum Development:

- PHYS 217L (FA 2013): Keep lecture and lab in sync. Provide a lab final.
- PHYS 217L (FA 2014): Improve experiments such that non-physical results can be avoided, for example in experiment 11, where some students measured negative values for the heat loss.
- PHYS 217L (FA 2016): Shorten grading time used by the TA to provide students with more on-time feedback. Introduce each lab with mini-lecture. Provide a strict policy on report due-dates.
- PHYS 217L (FA 2017): Shorten grading time. Ensure that sufficient experimental set-ups are available in order to avoid large lab groups. Replace outdated and non-functioning equipment. Explain to students what is required in a lab, such as workload and commitment. Provide tutorials to students to learn on how to generate graphs on a computer.
- PHYS 315L (SP2013): Zeeman effect needs a CCD camera; NMR oscillator is faulty, needs repair; speed-of-light motor controller needs repair; Barnes Spectrometer needs to be mounted on a more reliable and reproducible platform; Silicon detector used in Rutherford-scattering lab is very noisy, need new ampmeter for use with this detector. Modify lab manual to emphasize the difference between uncertainties in derived and measured quantities. Upgrade software to Microsoft Office 2010.
- PHYS 315L (SP2014): Zeeman effect needs a CCD camera; control of semiconductor mount needs to be fixed, impossible to observe Hall voltage. Implement MatLab for data analysis. NMR oscillator is faulty, needs repair; speed-of-light motor controller needs repair; Barnes Spectrometer needs to be mounted on a more reliable and reproducible platform; Silicon detector used in Rutherford-scattering lab is very noisy. Continue modifying lab manual to emphasize the difference between uncertainties in derived and measured quantities. Setup and use of logbook to keep track of persistent problem in experimental setups.
- PHYS 315L (SP2015): Barnes spectrometer needs to be mounted. Continue improving lab write-ups.
- PHYS 315L (SP2016): Change sections of the lab manual and replace references to “accuracy” and “precision” with “uncertainty” and derived quantities. Replace Photoelectric Effect experiment since it is impossible to obtain meaningful results.
- PHYS 315L (SP2017): Use logbook to CANVAS and use its GROUPS option that gives each group a dedicated online workspace.
- PHYS 315L (SP2018): CANVAS/GROUP was a success and is now recommended to be default workspace for student online teamwork, file sharing, and messaging.
- PHYS 471L (F2012): Make clear to the students that the course is taught by instructors with different expectations.
- PHYS 471L (F2016): Acquire at least one more instrument and replacements for consumables such as graphite susceptors. Remind students on the use of common styles in presentations and written reports. Rubrics were used to evaluate teamwork.
- PHYS 475L (SP2015): Use a lab manual to orient the students and to provide more structure to the course, rather than hand-outs. Focus on a single experimental technique to

provide students with in-depth experience rather than surveying many different experimental techniques.

- PHYS 475L (SP2016): Instruct students that labs may require more time than the class meeting time. Make workload requirements must be made transparent to students.
- PHYS 475L (SP2017): Address student workload and commitment.
- PHYS 475L (SP2018): Allow students from other (physics) labs to share the same physical workspace as the PHYS 475 students. Distribute "lab-kits" that contain the necessary equipment for the experiment(s).

Implemented recommendations:

- PHYS 217L (FA 2016): Rather than requesting a complete report each week focus on one or two portions of the report (plus measurements and error analysis). Transparency in grading was accomplished by providing the students with rubrics. Provided some templates for students to use excel for visualization. Introduced two new labs, one for polarization and one for statistics and entropy. Rewriting of the lab manual for 9 labs.
- PHYS 217L (FA 2017): Introduced Readiness Assurance Tests (RATs) to improve student preparedness for the labs, many students found this useful. Lab report submission policies were strictly enforced (at most one week late). Added a new experiment on "Properties of Sound", rewrote error analysis and other handouts.
- PHYS 315L (SP2013): Replaced old hardware and upgraded software to Microsoft Office (2010). Modified lab report format to clarify the difference between uncertainties in measured and directly derived data. Tuning and calibration of Jarrell-Ashe spectrometer.
- PHYS 315L (SP2014): Computer upgrade to Microsoft Word 2010 completed.
- PHYS 315L (SP2015): Added 12-megapixel camera to Zeeman experiment. Continued to use instructor logbook for lab improvement and maintenance. Continued development of new and more detailed guidelines for lab reports. Speed-of-light experiment was fixed. NMR was re-introduced as an experiment. MatLab license was purchased and software was installed on the lab computers.
- PHYS 315L (SP2016): Use of instructor logbook to record solutions and problems that were encountered during the labs. Leybold precision voltmeter for Hall effect experiment and the controller for the Franck-Hertz experiment were replaced. Two neon tubes were purchased to expand the Frank-Hertz experiment that was previously solely based on Mg tubes.
- PHYS 315L (SP2017): Started transition to CANVAS GROUP option for student online collaboration, file sharing, and messaging. Improved and retained Photoelectric Effect experiment. TA was a graduate student.
- PHYS 315L (SP2018): Completed transition CANVAS GROUP option for student online collaboration, file sharing, and messaging. TA was a graduate student.
- PHYS471L (F2012): This was the first time the course was taught in a long time and new experiments were used.
- PHYS 471L (F2016): Continuation of lab manual development, added more material and a section of XRD safety training. Introductory lectures on spectroscopy and the use of

latex for report preparation were provided to orient students at the beginning of the course.

- PHYS 475L (SP2017): Made students aware of workload and commitment.
- PHYS 475L (SP2018): Discussed expected workload and commitment with students at the beginning of the semester.

Loops closed:

- PHYS315L: MatLab allows using the same software that is emphasized in engineering courses. Guidelines continue to be developed to assist students in error analysis and statistics.
- PHYS 471L: Teamwork was assessed through rubrics.
- PHYS 475L: Teamwork was assessed through group projects.
- PHYS 217L: outcome (D) was not measured.

Your own assessment of the assessment process for the outcome: Are the tools working, or some better than others? Recommended changes?

- PHYS 217L: It is not clear if and how outcome (d) was measured, hence it is not possible to evaluate the outcome assessment tool.
- PHYS 315L: It remains unclear how the team participation grade is used to guide future improvements of the course. Team participation is variable and it seems that in many cases working in teams is understood as a means to reduce workload in the course. Many experiments have been upgraded/repaired/revised, this will give access to a wider variety of lab experiments and support new opportunities for teamwork. The only measurement available is through team participation so it is impossible to establish a comparison. It is excellent to move student online teamwork to CANVAS, that reduces maintenance of a local file server and every student enrolled in the course has automatic access to this service. Using a graduate TA seems beneficial since he/she can better assist the teams.
- PHYS 471L: It is not clear how outcome (d) was measured in F2016 and hence it is not possible to evaluate the outcome assessment tool.
- PHYS 475L: Insufficient information was provided to evaluate if the tools are working or not. It is an interesting idea to provide a common workspace where students from all undergraduate labs can come together and exchange ideas.

Recommended changes:

- Collect data from a wider range of courses to understand better which assessment tools work.
- PHYS 217L: Provide information on how outcome (d) was assessed.
- PHYS 315L: It may be worthwhile to have students evaluate another team members report. This may enforce for team members to work together more closely and to communicate better.
- PHYS 471L and 475L: Provide details how outcome (d) was assessed and how the numerical values listed in the Post-Course Instructor Comment Form were obtained.

Exhibit Material for ABET visit

Materials available to the ABET team during their site visit

The *Department of Physics* and the *Engineering Physics Program Committee* store all data relevant to the *Engineering Physics Program* electronically on a designated *OneDrive* folder, with exception of examples of student work. The ABET team will have access to all relevant data contained in that folder at the time of their site visit. In addition, the *EP Program* will provide hard copies of materials in four different sets of binders, the contents of which are listed below.

'Maroon' Instructor's Notebooks

At the end of each course, instructors are expected to prepare the following materials and upload them to the relevant course folder on *OneDrive*:

- completed *Post-Course Instructor Comment Form*
- supporting material of how the *Program Outcomes Assessment* was done, if necessary
- the course syllabus and actual schedule followed
- copies of exams, quizzes and homework, or references thereto
- final-grade calculation spreadsheet (with student names removed)
- copies of other class materials that were provided, or references thereto

For the ABET site visit, we will provide physical folders for each (required or elective) physics course in so-called *'Maroon' Instructors Notebooks*. Each *Instructor's Notebook* contains a) a full set of materials the last time the course was taught prior to the site visit and b) copies of the *Post-Course Instructor Comment Forms* every time that course was taught since Fall 2012. The engineering departments use their own *Assessment Processes*, and therefore, we cannot provide similar materials for engineering courses.

'White' Course Notebooks

The *'White' Course Notebooks* are updated only once every six years, and they are intended to show student work in each (physics or engineering) course the last time it was taught prior to the ABET review. None of the student work is stored on *OneDrive*, and the materials provided are only available as hard copies. The ABET team will have access to *'White' Course Notebook* materials for all required and elective *Physics* courses and a few select engineering courses (2 each from *Aerospace*, *Chemical*, *Electrical*, and *Mechanical Engineering*), including examples of *Capstone Design* courses involving EP students. It should be noted that such materials are available for all engineering courses in the respective engineering departments, who will undergo their own ABET evaluation at the same time. The *Course Notebooks* contain the following:

- a course overview
- the syllabus and schedule followed
- copies of all assignments, i.e. pre-req. test, exams/labs/quizzes/homework/projects
- copies of student work for each assignment (typically: high/medium/low)
- hand-outs and other material used
- the summary of student evaluations

'Blue' Outcomes Notebooks

All materials related to *Program Outcomes* are available on the designated *OneDrive* folder. For the ABET site visit, we will prepare 11 separate physical folders, one for each of the *Program*

Outcomes (a)-(k). The *'Blue' Outcomes Notebooks* will contain the following materials collected since Fall 2012:

- individual *Outcomes Summaries* of physics courses provided by faculty
- supporting material of how the *Program Outcomes Assessment* was done in individual physics courses, if provided
- summaries of *Senior Student Exit Interviews (SSEI)* of graduating EP students
- summaries of *ETS-MFT* tests

Outcomes Summaries from engineering are provided in *Criterion 4 – Continuous Improvement* of this Self-Study Report, and additional materials related to Program Outcomes in engineering courses will be available with the associated engineering departments, who will undergo their own ABET evaluation at the same time.

'Black' *Educational Objectives* Notebook

All materials related to Program Educational Objectives are available on the designated *OneDrive* folder. For the ABET site visit, we will prepare a physical *'Black' Educational Objectives Notebook*, which contains the following:

- *Engineering Physics (EP) Program Committee* meeting minutes, since Fall of 2012
- 2014, 2016, 2017 and 2018 *Engineering Physics External Advisory Board (EPEAB) Reports* and meeting minutes
- summaries of 2014 and 2017 *Alumni Surveys*
- other relevant information

The EP Program will also provide copies of textbooks, laboratory manuals and other course materials for all physics and some engineering courses that are taken by EP students as part of their curriculum.