PURDUE SCHOOL OF ENGINEERING AND TECHNOLOGY 2014-2015 ACADEMIC YEAR ASSESSMENT REPORT

Prepared by the School's Assessment Committee and Karen Alfrey, Chair

July 15, 2015

Introduction

The Purdue School of Engineering and Technology, IUPUI (E&T) continues its tradition of reporting its outcomes assessment activities by department or (where appropriate) by academic program. The assessment activities of most programs in the school are guided by the discipline-specific accreditation requirements of ABET, Inc. (http://abet.org/, formerly the Accreditation Board for Engineering and Technology), which accredits our engineering, technology, and computing programs; of the National Association of Schools of Music (NASM, http://nasm.arts-accredit.org/), through which the department of Music and Arts Technology is accredited; and of the Council for Interior Design Technology (CIDA, http://www.accredit-id.org/), the accrediting body for our Interior Design Technology program. The Organizational Leadership and Supervision (OLS) program, which is not accredited at the program level, uses the campus's Principles of Undergraduate Learning (PULs) as their framework for program assessment. Technical Communications (TCM) offers a certificate program and a recently-established Bachelor's degree in Technical Communication, as well as providing supporting coursework (and assessment data on student learning outcomes in those courses) for many of the programs in the school.

School Assessment Processes

The program outcomes defined by ABET, NASM, and CIDA to describe the knowledge, skills, and habits of mind expected of successful graduates of these programs cover the same broad areas as IUPUI's Principles of Undergraduate Learning, but with more specificity appropriate to the needs of each discipline. (ABET outcomes for engineering programs, for example, include several outcomes that could be considered specific examples of Quantitative Skills, one of the PULs.) Thus, by focusing on attainment of discipline-specific outcomes, programs are assured of meeting the more broadly-defined PULs.

Student Learning Outcomes for each undergraduate program are published in the Bulletin: http://www.iupui.edu/~bulletin/iupui/2014-2016/schools/purdue-enginer-tech/undergraduate/student_learning_outcomes/index.shtml. For engineering programs, ABET defines eleven core outcomes (commonly designated as "a through k" in keeping with ABET terminology):

> Upon completion of this program, students will be able to demonstrate:
> a. an ability to apply knowledge of mathematics, science, and engineering.
> b. an ability to design and conduct experiments, as well as to analyze and interpret data.
> c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
> d. an ability to function on multidisciplinary teams.
> e. an ability to identify, formulate, and solve engineering problems.
> f. an understanding of professional and ethical responsibility.
> g. an ability to communicate effectively.
> h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i. a recognition of the need for, and an ability to engage in life-long learning.
j. a knowledge of contemporary issues.
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Some programs may define additional program-specific outcomes appropriate to their discipline. For baccalaureate degree programs in engineering technology, the eleven core "a through k" ABET outcomes are:

Upon completion of this program, students will be able to demonstrate:
a. an ability to select and apply the knowledge, techniques, skills and modern tools of their disciplines to broadly-defined engineering technology activities;
b. an ability to select and apply a knowledge of mathematics, science, engineering and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;
c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
d. an ability to design systems, components or processes for broadly-defined engineering technology problems appropriate to program educational objectives;
e. an ability to function effectively as a member or leader on a technical team;
f. an ability to identify, analyze and solve broadly-defined engineering technology problems;
g. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;
h. an understanding of the need for and an ability to engage in self-directed continuing professional development;
i. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;
j. a knowledge of the impact of engineering technology solutions in a societal and global context; and
k. a commitment to quality, timeliness, and continuous improvement.

Each undergraduate course taught in the school has identified one or more emphasized PULs, as well as any discipline-specific outcomes emphasized in the course. Based on these defined areas of emphasis, specific courses may be targeted for assessment of a given outcome. The bulk of program assessment is administered and performed at the department level, with the school assessment committee providing a mechanism for sharing resources and best practices, as well as disseminating information and guidance on new campus-level assessment processes. Due to the needs of program accreditation, most assessment data is framed in the language of discipline-specific outcomes; however, due to the significant overlap between these disciplinary outcomes and the broader language of the PULs, programs that successfully meet their disciplinary outcomes simultaneously satisfy the PULs; and mappings between discipline-specific outcomes and the PULs have been established for each program. An example of such a mapping is shown in the table on the next page.

Prompted by the establishment of Principles of Graduate Learning at IUPUI, graduate programs in the School of Engineering and Technology have likewise established student learning outcomes, published in the Bulletin: http://www.iupui.edu/~bulletin/iupui/2012-2014/schools/purdue-enginer-tech/graduate/student_learning_outcomes/index.shtml Due to the highly specialized, integrative nature of graduate programs, assessment of these outcomes focuses primarily on the thesis (or final project) rather than on individual courses.

ABET/EAC Criteria #3 2011-12 Evaluation Criteria **Engineering programs must demonstrate that their students attain:**	**INDIANA UNIVERSITY-PURDUE UNIVERSITY INDIANAPOLIS PRINCIPLES OF UNDERGRADUATE LEARNING**							
	PUL 1 Core Communication and Quantitative Skills			**PUL 2** Critical Thinking	**PUL 3** Integration and Application of Knowledge	**PUL 4** Intellectual Depth, Breadth, and Adaptiveness	**PUL 5** Understanding Society and Culture	**PUL 6** Values and Ethics
	A	**B**	**C**					
(a) an ability to apply knowledge of mathematics, science, and engineering		X		X	X	X		
(b) an ability to design and conduct experiments, and analyze and interpret data		X		X	X	X		
(c) an ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability				X	X	X		
(d) an ability to function on multidisciplinary teams	X					X	X	
(e) an ability to identify, formulate, and solve engineering problems		X		X	X	X		
(f) and understanding of professional and ethical responsibility				X	X	X	X	X
(g) an ability to communicate effectively	X						X	
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context					X	X	X	X
(i) a recognition of the need for, and an ability to engage in life-long learning			X	X			X	X
(j) a knowledge of contemporary issues				X		X	X	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice			X		X	X		

School Assessment Milestones

In September 2014, the School of Engineering and Technology underwent a program review of advising services. The recommendations of the review committee have led to organizational changes particularly in the New Student Academic Advising Center (NSAAC) and Student Services offices for Engineering & Technology. These changes, still in the implementation phase, are described in more detail below in the NSAAC section.

In preparation for the next ABET accreditation visit in Fall 2016, all Engineering and Computing programs in E&T underwent a mock-ABET review conducted by external reviewers with extensive experience in ABET assessment and accreditation. The main focus of this review was the self-study document compiled by each program. The review resulted in a number of suggestions to improve these documents; most of these suggestions were about organizing information to comply with current ABET standards and evaluator expectations, rather than concerns over the programs or learning outcomes themselves.

The Music and Arts Technology program is currently working on their self-study for their next National Association of Schools of Music (NASM) accreditation visit. They plan to submit the document next year in preparation for a spring 2017 accreditation visit. This year they will be collecting data to ensure that they are compliant with the new criteria for Music Technology programs established since their initial accreditation. A summary of the results of this data collection and review will be included in next year's annual report. In addition, the department is putting processes in place for a new PhD program, anticipated to start in 2016.

The first Ivy Tech pre-engineering Associate's degree graduates entered the IUPUI engineering programs in August. Of nine students in this initial cohort, eight continue to make good degree progress after one year, with an average GPA after one year of study of 3.1. On average, students in Electrical and Computer Engineering (ECE) are showing better academic performance at IUPUI than those in Mechanical Engineering (ME): with the exception of the single ECE student who is not making good academic progress, all Ivy Tech pre-engineering ECE students had semester GPAs ranging from 2.9 to 4.0 in their first two semesters at IUPUI; in contrast, the three ME students had semester GPAs ranging from 2.5 to 3.0 in their first two semesters. It is not yet clear whether this difference is due primarily to a disparity in grading standards between the two IUPUI departments, a difference in preparation for major classes, or other factors. We will continue to monitor the progress of students transferring from this program and work with our Ivy Tech colleagues to ensure that these students are well-prepared for success in IUPUI engineering programs.

The Engineering and Technology Student Council has created a new appointed student position, the Coordinator of Academic Success Initiatives, to develop and implement interventions designed to improve student learning outcomes and decrease DFW rates, particularly in freshman and sophomore STEM classes. The Coordinator has been working over the summer on plans to pilot Peer-Led Team Learning initiatives in several engineering classes in the coming year.

The E&T 2014-2015 Assessment Committee

This year the E&T Assessment Committee was chaired by Karen Alfrey, Director of the Undergraduate Program in Biomedical Engineering. The members of the 2014-2015 committee were the following:

Karen Alfrey, Biomedical Engineering
Mark Atkins, Ivy Tech
Dan Baldwin, Computer Graphics Technology

J. Bradon Barnes, Ivy Tech
Elaine Cooney, Engineering Technology
Robin Cox, Music and Arts Technology
Eugenia Fernandez, Computer Information and Graphics Technology
Elizabeth Freije, Electrical and Computer Engineering Technology
Michael Hall, Ivy Tech
Stephen Hundley, Technology Leadership and Communication
Pete Hylton, Motorsports Engineering
Alan Jones, Mechanical Engineering
Michele Luzetski, New Student Academic Advising Center
Charlie McIntyre, Construction Engineering Management Technology
Emily McLaughlin, Interior Design Technology
Corinne Renguette, Technical Communications
David Russomanno, Dean
Seemein Shayesteh, Electrical and Computer Engineering
Elizabeth Wager, Organizational Leadership and Supervision
Jennifer Williams, Career Services
Wanda Worley, Associate Dean for Undergraduate Programs
Paul Yearling, Mechanical Engineering Technology

Departmental and Program Annual Reports for 2014-2015

The 2014-2015 departmental and program assessment reports included in this school report represent the collected works of the following:

- Biomedical Engineering (BME)
- Mechanical and Energy Engineering (ME/EEN)
- New Student Academic Advising Center (NSAAC)

The table below outlines reporting for the school over the last three years. Previous years' reports are available at http://www.planning.iupui.edu/43.html under "School Assessment Reports".

Programs		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
BME		x	x	x	x	x	x
EE/CE				x		x	
ME/EEN		x	x			x	x
MSTE				x		x	
CIT		x				x	x
CGT		x	x			x	x
IDT			x	x	x	x	
TCM		x			x		
OLS				x	x		
ECET		x	x	x	x	x	
MET				x	x	x	
HETM		x			x	x	
CEMT		x	x	x	x	x	
MAT		x	x				
NSAAC		x					x

DEPARTMENT OF BIOMEDICAL ENGINEERING 2014-15 ASSESSMENT REPORT NARRATIVE
Written June, 2015

The undergraduate Biomedical Engineering program is on-track for its next ABET accreditation visit in Fall 2016. In preparation for this visit, we collected data on all ABET learning outcomes during the 2014-15 academic year and conducted a focus group with BME alumni in the spring; furthermore, all IUPUI engineering programs underwent a mock-ABET review in March and received feedback on the initial draft of our self-study documents from external reviewers with extensive ABET program evaluation experience.

Table 1 shows the plan for which ABET outcomes are targeted for assessment in which courses; for each course, one or more Performance Indicators are defined for each assessed outcome (e.g. "Students will successfully complete a laboratory assignment with a pre-lab component, data collection component, and analysis component" as an indicator of Outcome B, "Students will demonstrate an ability to design and conduct experiments, and analyze and interpret data," in BME 241) along with a Target for Performance (e.g. "70% of students will earn grades of 70% or higher in the assessed lab assignment"). Any outcome for which we fail to hit our Target for Performance on more than one of the associated Performance Indicators becomes a possible area for further investigation and improvement.

	ABET Outcomes											
Course	a	b	c	d	e	f	g	h	i	j	k	Course title
ENGR 195						X			X			Engr Seminar
ENGR 196								X				Engr Prob Solving
BME 222				X			X		X		X	Biomeasurements
BME 241	X	X			X							Intro Biomechanics
BME 331			X		X							Biosignals/Systems
BME 334							X				X	Biomed Computing
BME 381	X											Implant Materials
BME 383			X									Probs in Implant Mat
BME 322		X										Prob/Stat for BME
BME 352						X				X		Tissue Behav/Prop
BME 354				X								Probs in Tissue Behav
BME 411							X					Quantitative Physiology
BME 442					X							Biofluid Mechanics
BME 461	X											Transport Proc in BME
BME 491/492		X	X	X		X		X		X	X	BME Senior Design I+II
BME 402									X			BME Seminar
TCM 360							X	X				Comm in Engr Practice

Table 1: Courses targeted for ABET outcomes assessment.

Major Findings from Data Collection
Data collected during the Spring 2015 semester is still being evaluated. Data from Fall 2014, however, covered all ABET outcomes and showed promising results. The data indicated that we are successfully meeting all ABET outcomes except Outcome A, "Students will demonstrate an ability to apply knowledge of mathematics, science, and engineering." However, although we fell short of our goal for Outcome A on all four Performance Indicators for which we collected

data in the fall, a bit of additional analysis suggests that this is due more to flaws in the assessment process than to a failure of students to achieve the desired level of competence with Outcome A. By happenstance, both courses targeted for assessment of Outcome A in the fall were taught by the same instructor, who was teaching as a primary course instructor for the very first time. This was also his first experience with program assessment. In discussing the assessment results from BME 241, which relied on an exam problem on applying knowledge of math, physics, and mechanics toward solving a biomechanics problem (with a Target of Performance that 70% of students score at least 80%), the instructor made the following observations:

- The assessed problem was for many students part of their very first exam in any BME class. Thus, the students did not yet understand instructor/program expectations for how much work to show or explanation to give when attempting such a problem. He feels that the overall low scores on the problem are due more to students' not effectively demonstrating knowledge and understanding that they did in fact possess, rather than to a fundamental lack of mechanics knowledge. By his estimation, if these same students had tackled this problem on Exam 2 rather than Exam 1, those who scored in the vicinity of 50% would instead have improved their scores in the vicinity of 75% simply by showing their work more clearly.
- The target of 80% is really too high for problems given in a high-pressure and time-limited exam setting. We come much closer to meeting our performance goal when we instead use a cutoff score of 60%, which the instructor considered equivalent to a B- based on how he graded this problem.

Similarly, for BME 381, although we fell a little bit short of our stated Targets for Performance for Outcome A with all three Performance Indicators defined for that class, our students seem to be performing adequately overall on this outcome. It is worth noting that on the two exam problems, a large number of students (28.6% of the class) fell just shy of the target score, achieving scores in about the B- range. Therefore, although we failed to meet our stated target for performance, overall student performance is close enough to that mark that it is not a major cause for concern. In future semesters we will re-evaluate our stated targets for performance to consider whether they need to be adjusted somewhat, particularly for exam problems, to be a more realistic assessment of what a competent student should be able to achieve.

Discussion among the faculty about assessment of Outcome D, "Students will demonstrate an ability to function on multidisciplinary teams," revealed some concern about how this outcome is being assessed – and in particular, about whether we are doing a sufficient job fostering this skill in our lower-level classes. The Senior Design courses (BME 491 and 492) are a two-semester, team-based design experience with a robust teamwork assessment process and ample opportunity for feedback to students about their performance as a team, and as individuals contributing to a successful team environment. However, in lower-level classes, many faculty members have been using successful completion of group assignments (most commonly laboratory assignments with one or more lab partners) as an indicator of successful teamwork, without taking into account such factors as whether all team members contributed equitably to the project. We are experimenting with a new assessment process that solicits peer feedback from team members as well as the observations of the laboratory supervisor to get a better handle on our students' teamwork skills; the data from this new process is being analyzed this summer.

Results of Improvement from 2012 Assessment Cycle

The BME department collects assessment data every three years (thus allowing two cycles of data collection, evaluation, and program improvement in each six-year ABET accreditation cycle). In BME 33400 Biomedical Computing, assessment results in 2012 demonstrated that overall, students met attainment goals for the learning outcomes assessed in that course (Outcome G, ability to communicate effectively; and Outcome K, ability to use the skills, techniques, and modern engineering tools necessary for engineering practice). However, a closer look at the data revealed that students in the Butler Engineering Dual Degree Program (EDDP) consistently struggled with any assignment that required programming and implementing a computational model or technique in MATLAB, much moreso than their IUPUI peers. The dual-degree program is a five-year program through which students simultaneously pursue a Butler science or liberal arts degree and an IUPUI engineering degree, with most of the coursework in the first two years (including foundational math, science, and freshman engineering courses) completed at Butler. After the 2012 assessment cycle we solicited feedback from EDDP seniors and recent graduates about changes that might help better prepare Butler students for the computational rigor of the junior and senior years of the BME program. Partly as a result of this feedback, we made two changes in the sophomore year:

- We have switched the order of the BME 241 Introductory Biomechanics and BME 222 Biomeasurements classes so that BME 241 is now offered in the fall at IUPUI and in the spring at Butler, with BME 222 offered in the spring at IUPUI. Previously BME 222 was the introductory class at IUPUI and was offered at Butler in the spring. The new sequencing follows more logically from the sequencing of the Physics prerequisites for these courses: PHYS 152 Mechanics is a prerequisite for BME 241 as well as for PHYS 251 Heat, Electricity, and Optics, which itself is a prerequisite for BME 222. The new sequencing allows some EDDP students to begin taking BME classes earlier in their 5-year plan, thus allowing them to integrate more quickly with engineering classmates and faculty and thus get earlier support in areas in which they may need additional help, such as programming.
- We have increased the use of MATLAB in BME 241 and BME 222 to give students additional practice earlier in the curriculum with the computing tools they will need in the junior and senior year.

This year (2015) is the first year we have assessed the results of those changes. Although Butler students on average still lag behind their IUPUI peers in their programming effectiveness, the numbers from this year’s assessment suggests that they have made strides toward closing that gap. In 2012, five students in BME 334 scored below the target score of 70% on Programming Assignment 1: of those five, one was an IUPUI student who scored 69%, and the other four were Butler students who scored 34.5%, 52.5%, 54%, and 55%, respectively; moreover, no Butler student that year scored above the target score of 70%. In contrast, this year the three Butler students who took BME 334 scored 62%, 69%, and 75.5%, respectively, on this assignment. While there is still clearly room for improvement, this represents a significant improvement over previous results. We will share our most recent assessment results with the coordinator and director of the Butler Engineering Dual Degree Program, with the suggestion that more significant improvements may require revising the introductory computing class at Butler or allowing BME-interested students to take the IUPUI version of the class.

Feedback from Alumni Focus Group

In February 2015 the department conducted a focus group with six BME alumni who graduated within the last four years and are now pursuing a wide range of careers and educational opportunities: three are working in a technical capacity in biomedical and healthcare-related industries; one is a sales representative for an orthopedic device company; one has completed a Master's degree in BME and is now pursuing a PhD; and one is in his second year of medical school. Several themes emerged from the discussion, as well as a few suggestions for curricular improvements:

- All six participants agreed that overall they felt well-prepared for their current roles by their undergraduate BME experience. Several participants pointed to the rigor and challenge of the program as a particular strength, both in helping them develop useful workplace skills (thinking logically and algorithmically; self-teaching and learning quickly under pressure; analysis and engineering intuition; programming) and in preparing them to navigate the challenges of high-pressure environments (graduate school, medical school, medical sales).
- Four out of six participants explicitly mentioned the importance of good communication skills in their current roles. This echoes comments from our previous focus group in 2010, in which almost every participant expressed surprise that their jobs focused so heavily on communication (including documentation, grant-writing, email communication with colleagues, and presentations). In response to that earlier feedback, the department has increased the number of assignments in the curriculum that include a formal written report in order to give students more practice with and feedback on technical writing. This year's participants seemed satisfied with their educational foundations in written communication, but suggested that students could use more opportunities to practice oral presentation skills – perhaps through regular small-stakes opportunities rather than (or in addition to) adding one or two big project presentations.
- The PhD student commented that despite having pursued the Biomaterials and Tissue Engineering depth area as an undergraduate, she did not feel competent enough in that area to be effective at the start of her biomaterials-focused Master's degree (though her other technical skills, such as programming and mathematical analysis, were solid), and so had to do a lot of additional work to learn biomaterials on her own. (She did comment that she had skipped the Introductory Biomaterials elective and took 500-level materials and tissue-engineering courses instead, so some of what she missed may have been in that course.) The medical student, who also pursued that depth area, agreed that he did not feel that he had a strong biomaterials background even though he did take the Introductory Biomaterials course.
- Additional suggestions for improvements to the program included more exposure to 3-D modeling tools for mechanical design as well as more hands-on experience with material/mechanical failure and other aspects of turning a theoretical design into a physical device.

In response to these suggestions from our alumni, this year we have added two new 400-level electives as options for the Biomaterials and Tissue Engineering track. We will carefully monitor the outcomes from those classes and in particular follow up with students who go on to graduate school for biomaterials after taking those classes to see if they are providing a sufficient foundation of knowledge and skill. Furthermore, to provide a better foundation with 3-D modeling and design tools, a mechanical modeling problem using the Ansys mechanical modeling tool has been added to the BME 241 Intro Biomechanics lab. To reinforce that modeling skill, additional Ansys problems will be added to BME 334 Biomedical Computing as well as the more mechanics-focused classes in the junior and senior year.

Graduate Program Assessment and Improvement

This year the BME Graduate Committee developed guidelines for assigning and assessing student work for BME 69700 Directed Readings in Biomedical Engineering. In this independent study course, students work with a faculty mentor who assigns readings (typically research papers) that they meet to discuss periodically. The student is also expected to produce a final paper that discusses the assigned readings. The new guidelines provide a framework for expected length and depth of analysis of this final paper depending on whether the student is taking the course for 1, 2, or 3 credit hours. The guidelines also lay out a process for feedback from the graduate committee to the student and the faculty mentor; this process will help ensure that students and mentors (particularly mentors from non-BME departments – for example, medical school faculty) get appropriate guidance and feedback about BME departmental expectations for graduate-level student work.

The Graduate Committee will be developing similar guidelines for BME 69600 Advanced Biomedical Engineering Projects during the coming year. All non-thesis Master's students in BME are expected to complete a mentored project as part of their Plan of Study; these projects (for non-thesis students) and the final thesis and defense (for thesis students) are the primary targets for assessment of the Master's program. As a first step, this year the Graduate Committee responded to concerns about the quality of last year's BME 69600 project presentations by requiring students to complete at least one semester of graduate coursework, including coursework that provides foundational knowledge and skills for a project of interest (such as a BME 69700 Directed Readings course) before pursuing a BME 69600 project. As a result of this change, the Graduate Committee noted significant improvements in project presentations this year, particularly in students' ability to field questions from committee members about the technical details and relevance of their projects.

In addition, this year the student-run BME Graduate Student Council developed and administered their own Course Survey Questionnaire to solicit feedback from current BME graduate students about their experiences in the program and suggestions for improvement. Among the most significant findings (supported by most survey responses) were:

- Students generally felt that the available graduate courses – including those in other departments, such as math, biology, and other engineering departments – could be more rigorous and challenging.
- Students expressed a strong preference for project-based courses, particularly those students pursuing the non-thesis option.
- Most students (75%) agreed that their academic advisors were helpful in assisting them with their academic plans; only one student (6%) believed their academic advisor was unhelpful.

This feedback, which affirms our students' desire for rigorous coursework and the development of hands-on skills that will prepare them for jobs in industry, has been shared with the BME graduate committee.

DEPARTMENT OF COMPUTER INFORMATION & GRAPHICS TECHNOLOGY

2014-15 ASSESSMENT REPORT NARRATIVE
Submitted Oct 2015

Both the Computer Graphics Technology and Computer Information Technology undergraduate programs are on-track for their next ABET accreditation visit in Fall 2016. In preparation for this visit, we collected data on all ABET learning outcomes during the 2014-15 academic year. In addition, both programs underwent a mock-ABET review in March and received feedback on the initial draft of our self-study documents from external reviewers with extensive ABET program evaluation experience.

Tables 1 & 2 shows the data collection plan for CIT and CGT, respectively. Each table shows which ABET outcomes are targeted for assessment in which courses. One or more Performance Indicators from various courses are selected for each assessed outcome along with a Target for Performance (e.g. "70% of students will earn grades of 70% or higher in the assessed assignment"). Any outcome for which we fail to hit our Target for Performance on more than one of the associated Performance Indicators becomes a possible area for further investigation and improvement.

Table 1. CIT Data Collection Plan

	ABET Outcomes													
Course	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CIT 11200	X						X	X						
CIT 20200		X												
CIT 20300	X				X									
CIT 20700	X													
CIT 21200							X				X			
CIT 21300		X				X								
CIT 21400	X	X	X											
CIT 21500			X											
CIT 22000	X													
CIT 24200			X											
CIT 27000			X											
CIT 31200									X				X	
CIT 31300										X	X			
CIT 32700			X			X			X					
CIT 34700										X				
CIT 37300						X	X							
CIT 37400		X		X										X
CIT 41200									X					
CIT 41500													X	
CIT 42000				X			X		X					
CIT 44400							X			X			X	
CIT 45100										X			X	
CIT 46000						X								
CIT 47900											X			
CIT 48500						X		X				X		

OLS 26300					X									
OLS 37100														X
TCM 25000						X								

Table 2. CGT Data Collection Plan

	ABET Outcomes								
Course	a	b	c	d	e	f	g	h	i
CGT 10100		X				X	X		X
CGT 11100		X	X			X			
CGT 11200									X
CGT 11600	X	X							
CGT 11700									X
CGT 21100			X		X				
CGT 24100									X
CGT 25100					X	X			
CGT 29900								X	
CGT 34000						X			
CGT 34600		X	X				X		
CGT 35600								X	
CGT 41100				X	X				
CGT 41600				X	X				
CGT 44200								X	
CGT 44400	X		X						
CGT 44600			X	X		X	X	X	
CGT 45100	X								X
CGT 45600	X								

The major task during the 2014-2015 academic year was to collect all the data shown in the above tables. Evaluation of the data is scheduled for the 2015-2016 academic year.

Improvements made during last evaluation cycle

The following material summarize specific actions taken to improve the programs, including the major actions taken, basis for the action, and observed results of the action. Many of these activities were initiated following reviewing direct and indirect assessment data, concerns from faculty, industrial advisory board recommendations, and observed student achievement.

<u>CIT PROGRAM</u>

Action:

Moved content in networking and security courses from 300 to 200 level

Basis for Action:

Content of the courses were being taught at community college level

Results:

This allowed us to increase the amount of higher level course content in the 300 level courses and made room for new 300-levelcourses in wireless security, digital forensics, applied secure protocols, and risk assessment.

Action:
Replaced IT history content in CIT 12000 with active learning of preprogramming concepts
Basis for Action:
The D F W rate in CIT 14000 was very high
Results:
No change in the DFW rate was effected. However, student comments indicate a better understanding of basic programming constructs, and the average course grade for CIT 14000 improved slightly from 73% to 78%.

Action:
Replaced the 2nd 200-level programming course requirement in the Web Development concentration with a upper level mobile programming selective
Basis for Action:
Meet current industry needs as advised by IAB and maintain consistency of including only upper level courses in the concentrations
Results:
None yet.

Action:
Changed the prerequisite sequence between CIT 34400 Database Security and CIT 49900 Database Programming
Basis for Action:
Students had major problems in CIT 34400 in Spring 2013 and had generally poor performance as we did not realize that PL/SQL knowledge from CIT 49900 was needed to adequately prepare students for the current concepts added to the course that semester
Results:
Final grades in Spring 2015 not yet evaluated yet, but lack of student complaints indicate an improvement.

Action:
While converting CIT 21300 to the flipped classroom model, a series of integrated assignments was introduced so that when students are presented with the Final Project, they will have a more well-rounded understanding of how the various analysis techniques work with (and build upon) one another
Basis for Action:
Data collected in spring 2010 indicated that students had trouble producing a requirements document for the final project
Results:
Student performance on the requirements document went from 73% meeting the threshold to 90% meeting the threshold.

Action Taken:

An experiential learning component was added as a requirement to the CIT plan of study. This can be satisfied with an internship, an independent senior project, or participation in CIT 48500 The Living Lab

Basis for Action:

This was instituted for two reasons: (1) in response to a campus RISE initiative to increase student participation in research, international program, service learning and experiential learning, (2) increased call for experience by employers before graduation.

Results:

This requirement was added to the new 2009 plan of study.

CGT PROGRAM

Action:

Developed intensive CGT courses to better serve our students and graduate them faster

Basis for Action:

The state has placed an increased value on 4-year graduation rates. As a result, the CGT program developed sweeping changes in the standard 16-week semester course schedule. CGT has adopted 8-week intensive courses throughout both curricular tracks providing opportunity for students to graduate early.

Results:

After several successful intensive course pilots, CGT adopted 8-week courses in the Fall of 2012. Since that time, all lower level CGT courses have been taught first 8-weeks, and all upper level courses have been taught second 8-weeks. Senior capstone classes, CGT 41100 and CGT 41600, are the only exceptions and meet the entire 16-weeks. This new schedule allows students increased flexibility to better navigate their plan of study in a timely fashion, and has reduced bottlenecks in the curricula.

Action:

Increased the scope of the CGT Study Abroad Program in Poland

Basis for Action:

Led by Professor Bannatyne, the CGT Study Abroad Program in Poland has been successful initiative for over a decade. As a result, the demand in Poland for computer graphics education and training has also increased.

Results:

In addition to our two existing Polish university partners, the CGT Study Abroad Program has been extended to include public schools and professional development seminars for practicing teachers in Poland. CGT now also grants internship credit for any student on the IMD or ASG curricular path for this month-long experience.

Action:

Transition the Animation and Preproduction course from the variable topics class CGT 49900 Select Topics in Computer Graphics to a new course number and title

Basis for Action:

After several investigative iterations, Animation and Preproduction is now a required course for students in the ASG curricular track. However, the variable topics course number CGT 49900 has caused confusion for students during enrollment, and issues with graduation audits.

Results:

In the spring of 2014 the IUPUI C4 committee, a campus committee that oversees all new computing course proposals, approved CGT 39000 Animation and Preproduction after months of discussion. The course is now being routed through the appropriate internal and external channels.

Action Taken:

Prepare animation track students for the current hostile employment outlook in animation and visual effects

Basis for Action:

California has long been known as the center for the animation and visual effects industries, however recent news has emphasized the global competition for these jobs. CGT sought to seek out an industry superstar who could give advice to students centered upon navigating this current climate, and increasing their chances of employment in these fields.

Results:

In conjunction with Professor Dan Baldwin, CGT worked with Visual Effects legend John Van Vliet to develop an online course entitled "The Road to Hollywood with John Van Vliet." The aim of this course was to better educate students on the culture of the community in which they wish to acclimate. Enrollment over the two offerings has averaged 50 students per course.

DEPARTMENT OF MECHANICAL ENGINEERING
2014 - 2015 ASSESSMENT REPORT NARRATIVE
Written June 2015

The Department of Mechanical Engineering (ME) is comprised of 15 full time faculty and one full time advisor who support BS through PhD programs. Since Fall 2000, we have assessed our programs for continuous improvement, guided by ABET, Inc. standards and the internal assessment processes of the IUPUI School of Engineering and Technology and the campus at large. The Mechanical Engineering program is accredited by ABET, Inc. and the Energy Engineering Program (EEN) is due to be accredited in 2016. The comprehensive 2010 ABET Self-Study for ME is under revision to reflect the changes and improvements since the last ABET visit. The new Self-Study will contain information about our constituents, assessment processes, findings, and associated changes over the previous six years as well as details of the ME course outcomes and their relationships with the IUPUI Principles of Undergraduate Learning (PUL).

Recent Improvements

In September 2014, the ME department held an ABET mock visit in which an ABET assessment team reviewed both the ME and EEN programs and pointed out areas for improvement, which included revision of the Undergraduate Program Educational Objectives to be broader statements, and simplification of the Student Outcomes for both the ME and EEN programs. In response to the ABET review, new objectives of the two programs (http://www.engr.iupui.edu/departments/me/undergrad/bsme/index.php, and http://www.engr.iupui.edu/departments/me/undergrad/bseen/index.php) were developed.

The Program Educational Objectives are very similar between the two programs and are as follows:

Graduates of the program will:

- meet or exceed the expectations of their employers.
- pursue advanced study if desired.
- assume leadership roles in their professions and/or communities.

The specific Student Outcomes (Learning Outcomes of the program) follow the accrediting agency format and are as follows:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Our department continues to assess our courses for learning and student satisfaction. We are in the process of performing direct student outcome assessment as well as specific course outcome assessment which includes jury evaluations on key courses and programs such as intern/co-op. Direct assessment of the Student Outcomes is performed in two separate classes by the instructor of the class. The instructor evaluates specific homework, exam, project, quizzes or reports to evaluate the level of competency the student has attained in that specific outcome. The direct assessment is then used to evaluate the program to identify areas of improvement. The department has participated in the school's effort to develop graduate program outcomes. For graduate program assessment, the department has been doing course outcome assessment and evaluation of thesis and project presentations.

A significant development in the department is the extension of the ME degree to the IUPUC campus. All assessment activities such as student outcome, course outcome, and student satisfaction surveys are being performed and coordinated with the IUPUI assessment activities.

A number of changes to the program occurred due to the assessment process. For example, student satisfaction surveys indicated problems with laboratory experiences and number of laboratories required. A few examples of the changes to the program that occurred due to the assessment process follows:

- Curriculum amendments Effective Fall 2013
    - Created the ME 39700 Mechanical Engineering Lab through lab reorganization
    - Introduced entrepreneurship and ethics at sophomore level
    - Allowed either Thermal-Fluid Design or Machine Design Path
- Implemented course outcome survey changes
- Removed recitation from 37200
- Raised GPA threshold for entering ME students
- Updated teaching labs with additional equipment , adjusted lab schedules for better utilization
- Implemented advising changes
- Implemented a minimum grade requirement in Sophomore engineering courses

Improvements also continue in the academic advising processes and related student satisfaction. Due to the increase in students in the ME department, additional administrative support has been hired to better serve the students as well as allow the student advisor to focus solely on advising activities. All students are required to attend advising, either through group meetings that are held once a semester for each class (sophomore, junior, senior) or through one-on-one meetings with the student advisor.

NEW STUDENT ACADEMIC ADVISING CENTER 2014-2015 ACADEMIC YEAR ASSESSMENT REPORT

Prepared by Michele Luzetski
June 2015

The New Student Academic Advising Center (NSAAC) continues to work toward our Vision "to increase retention of engineering and technology students by providing high quality academic guidance, support and motivation for engineering and technology study and strategies for success in upper level coursework as well as future careers." We strive for this goal through our Mission to:

- Help students develop strategies for success in engineering and technology study,
- Provide a welcoming environment and high quality academic guidance to current and prospective students,
- Assist with transfer credit evaluation and other academic procedures,
- Implement best practices through development and instruction of introductory engineering and technology courses

Along with our Vision and Mission, we work diligently with departmental programs in the School of Engineering and Technology to meet the requirements of their programs accreditation.

Academic Advising Program Review
This past Fall, the School of Engineering and Technology underwent an Academic Advising Program Review. The Review Committee consisted of people from our school, campus, community, and peer institutions. Based on recommendations from the Review Committee, there was a reorganization of the NSAAC . Since its creation, the NSAAC has reported to the Associate Dean for Academic Affairs and Undergraduate Programs and has housed the teaching of the First Year Seminar (FYS), and the three freshmen engineering courses – ENGR 19600, ENGR 19700, and ENGR 29700. As of June 1st, 2015, the NSAAC reports to the Assistant Dean for Student Services and along with the school's Career Services and Professional Development office. Additionally, the teaching of the three freshmen engineering courses separated from the advising center and became its own department. The advising center maintains coordination of the FYS program.

Changing the reporting structure of the NSAAC to sit beside the Career Services and Professional Development office has been viewed by all as a positive move. These two offices have traditionally worked closely together as they both work with students who are visiting campus as prospects, becoming oriented with campus as incoming students, and throughout their first couple of years as they navigate the transition to college.

Continuous Improvement
The NSAAC and the Career Services and Professional Development office will continue to work together to develop integrated programs and systems to better serve our students. As an example, both offices have recently adopted a new system to track student appointments. In time, the system will provide us data that shows how much time we spend with students in one-on-one meetings and what the focus of those meetings are. This may provide us with information to develop more directed services in areas with the most student needs.

Additionally, based on recommendations from the Review Committee, the School of Engineering and Technology has been and will continue to work on developing a common advising mission statement, a clarification of advising roles and responsibilities, and a review of the process to move students from the NSAAC to the departments.

Accreditation Outcomes in First Year Seminars

The First Year Seminars assess two accreditation outcomes – Lifelong Learning and Ethics. In the Fall of 2014, 5 FYS's collected data for these two outcomes. For Lifelong Learning, 160 students were assessed and 85% earned 70% or higher on the assignments. For Ethics, 143 students were assessed and 91% earned 70% or higher on the assignments. (see Appendix A for a breakdown by Program Code)

Continuous Improvement

While all our FYS sections talk about these outcomes, most of them have not given assignments that allow for assessment. It is a goal to have all our sections assess these two outcomes so we can better determine if our students as a whole are meeting the goals for these outcomes. To that end, the schools Learning Community Coordinator is working on a list of required components for each FYS section that includes assessable assignments for Lifelong Learning and Ethics.

The Learning Community Coordinator is also reviewing the possibility of adding Teamwork as an outcome that is assessed in the FYS'.

Increase in Enrollment Numbers

The table below shows an average increase of 82 students in the School of Engineering and Technology every Fall semester since 2011.

Table 1: Fall Headcount by Program

Program	Fall 2011	Fall 2012	Fall 2013	Fall 2014
Engineering Undergraduate	812	943	1,044	1,129
Engr Dual Dprgm Undergraduate	121	126	135	142
Music Undergraduate	39	64	70	66
Technology Undergraduate	1,461	1,403	1,348	1,341
Total	2,433	2,536	2,597	2,678

Student Retention from Freshmen to Sophomore Year

Looking at the 2011, 2012, and 2013 first-time freshmen cohorts, the NSAAC has a 3 year average of 72% in retaining students from Freshmen to Sophomore year.*

Table 2: Retention rates by cohort for students with specified plan codes

Engineering Programs

Biomedical Engr BS PU Fresh			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	36	78%	28
2012	40	93%	37
2013	30	83%	25
All	106	85%	90

Comptr Engr Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	13	85%	11
2012	25	76%	19
2013	26	54%	14
All	64	69%	44

Elec Engr Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	13	92%	12
2012	24	92%	22
2013	19	74%	14
All	56	86%	48

Ener Engr Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	1	100%	1
2012	7	100%	7
2013	8	63%	5
All	16	82%	13

Mech & Intdsp Engr Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	34	79%	27
2012	61	87%	53
2013	70	74%	52
All	165	80%	132

Motorsports Engr Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	12	58%	7
2012	5	100%	5
2013	20	70%	14
All	37	70%	26

Total Engineering Programs: 79% Retentaion Rate from Freshmen year to Sophomore year (3 year average)

Engineering Technology Programs

Comp Engr Tech Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	8	50%	4
2012	10	80%	8
2013	4	50%	2
All	22	64%	14

Const Engr Mgmt Tech Pu Fresh			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	9	89%	8
2012	7	71%	5
2013	5	80%	4
All	21	81%	17

Mech Engr Tech Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	10	60%	6
2012	10	50%	5
2013	9	78%	7
All	29	62%	18

Total Engineering Technology Programs: 68% Retention Rate from Freshmen year to Sophomore year (3 year average)

Technology Programs

Comp Graphics Tech Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	20	80%	16
2012	14	50%	7
2013	13	77%	10
All	47	70%	33

Comp Info Tech Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	23	74%	17
2012	27	59%	16
2013	34	71%	24
All	84	68%	57

Interior Design Tech Pu Fresh BS			
		Retained 1 year IUINA Campus	
Cohort Year	*N*	*%*	*N*
2011	3	67%	2
2012	4	100%	4
2013	11	73%	8
All	18	78%	14

Total Technology Programs: 70% Retentaion Rate from Freshmen year to Sophomore year (3 year average)

*This data does not assume students remained in their initial degree or with in the School of Engineering and Technology; only that they remained at IUPUI.

Appendix A: Accreditation Outcomes in First Year Seminars, by Program Code (Fall 2014)

Life Long Learning

	Passed, 70% or higher	Total	%
ENGR			
FRBME	6	10	60%
PBMEBSPU	3	3	100%
Total	9	13	69%
FRCEPR	9	9	100%
COMENBSCEP	2	2	100%
Total	11	11	100%
FREEPR	4	6	67%
EEBSEEPR	3	3	100%
Total	7	9	78%
FRMEPR	14	16	88%
MEBSMEPR	7	9	78%
Total	21	25	84%
MEMTSPTFRP	4	5	80%
ENRENGRBSP	1	1	100%
FRINTPR	2	3	67%
TECH			
FRCGTBSPR	11	11	100%
CGTBSBSPR	2	2	100%
Total	13	13	100%
EETBSBSPR	3	3	100%
FRCITBSPR	1	1	100%
FRPIDTBSPR	3	5	60%

Ethics

	Passed, 70% or higher	Total	%
ENGR			
FRBME	3	3	100%
FRCEPR	6	6	100%
COMENBSCEP	3	5	60%
Total	9	11	82%
FREEPR	6	6	100%
EEBSEEPR	5	7	71%
Total	11	13	85%
FRMEPR	21	22	95%
MEBSMEPR	11	11	100%
Total	32	33	97%
FRNNEPR	1	2	50%
FRINTPR	1	1	100%
MTRSENGFRP	3	3	100%
MEMTSPTFRP	2	2	100%
TECH			
FRCGTBSPR	1	3	33%
FRCPETBSPR	1	1	100%
CEMTBSPRP	1	1	100%
FRIDTBSPR	2	2	100%
PIDTBSPR	1	1	100%
Total	3	3	100%
FRMETBSPR	1	1	100%
METBSBSPR	2	2	100%
Total	3	3	100%
OLSBSBSPR	1	1	100%