PURDUE SCHOOL OF ENGINEERING AND TECHNOLOGY 2010-2011 ACADEMIC YEAR ASSESSMENT REPORT

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

July 3, 2012

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 provides supporting coursework, as well as 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/2010-2012/schools/purdue-engineer-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, and analyze and interpret data.
> 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.
> 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 lifelong 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 technology programs, the eleven core "a through k" ABET outcomes are:

Upon completion of this program, students will be able to demonstrate:
a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
c. an ability to conduct, analyze, and interpret experiments and apply experimental results to improve processes.
d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
e. an ability to function effectively in teams.
f. an ability to identify, analyze and solve technical problems.
g. an ability to communicate effectively in speech, writing, and visual presentation.
h. a recognition of the need for, and an ability to engage in lifelong learning.
i. an ability to understand professional, ethical and social responsibilities.
j. a respect for diversity and knowledge of contemporary professional, societal and global issues.
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 campus-level PUL assessment process, which calls for assessing PULs in every undergraduate class on a 5-year cycle, provides supplemental data on learning outcomes and a check on the validity of our program-specific outcomes data. 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. An example of the mapping between discipline-specific outcomes and PULs 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/2010-2012/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.

Assessment Milestones

As of August 2011, the undergraduate Biomedical Engineering program is now accredited by ABET, Inc. and the Electrical Engineering and Computer Engineering programs were re-accredited. The Mechanical Engineering program submitted an interim accreditation report in Spring 2012 to address some concerns,

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		

including re-wording the Program Educational Objectives to bring them in line with the latest ABET guidelines.

Following a multi-year review process, the Department of Music and Arts Technology and all its degree programs are now fully accredited by NASM.

In January 2012, IUPUI and Ivy Tech were selected to participate in the AAC&U Quality Collaboratives project, an initiative to develop best practices for the seamless articulation and transfer of coursework across institutions using the AAC&U's Degree Qualifications Profile as a framework. Building on existing ties established through the E&T Assessment Committee, faculty from both institutions are

working together to build a common assessment framework to ensure that students transitioning into the junior year of the Mechanical, Electrical, Computer, and Energy Engineering programs at IUPUI are equipped with the skills and knowledge they need to succeed, regardless of whether they completed their first two years at IUPUI or in the new pre-engineering sequence at Ivy Tech.

The school's Engineering Technology programs, the accreditation of which is overseen by the TAC (technology commission) of ABET, continue to prepare for their upcoming reaccreditation visit in Fall 2013.

In addition to being submitted to ABET review, copies of the self-studies compiled by all these programs in advance of their accreditation visits are on file in the Dean's Office of the School of Engineering and Technology. These self-studies provide additional details and analysis of the assessment processes and outcomes summarized in this report.

The E&T 2011-2012 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 2011-2012 committee were the following:

Karen Alfrey, Biomedical Engineering
Mark Atkins, Ivy Tech
J. Bradon Barnes, Ivy Tech
Stanley Chien, Electrical and Computer Engineering
Jerome Clark, Computer and Information Technology
Elaine Cooney, Engineering Technology
Cliff Goodwin, Organizational Leadership and Supervision
Stephen Hundley, Associate Dean for Undergraduate Programs
Alan Jones, Mechanical Engineering
Betty Klein, Design and Communication Technology
Ginger Lauderback, Mechanical Engineering
Roberta Lindsey, Music and Arts Technology
Emily McLaughlin, Design Technology
Janet Meyer, New Student Academic Advising Center
Darrell Nickolson, Design and Communication Technology
Corinne Renguette, Technical Communications
Kenneth Rennels, Engineering Technology
David Russomanno, Dean
Jane Simpson, Electrical and Computer Engineering
Bill White, Engineering Technology
Wanda Worley, Technical Communications (interim associate dean for undergrad programs, Fall 2012)
Paul Yearling, Engineering Technology

Departmental and Program Annual Reports for 2011-2012

The 2010-2011 departmental and program assessment reports included in this school report represent the collected works of the following:

Biomedical Engineering (BME)
Electrical Engineering (EE) and Computer Engineering (CE)
Construction Engineering Management Technology (CEMT)
Architectural Technology (ART) and Interior Design Technology (IDT)

Electrical Engineering Technology (EET) and Computer Engineering Technology (CpET)
Mechanical Engineering Technology (MET)
Motorsports Engineering (MSTE)
Organizational Leadership and Supervision (OLS)

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		2008-09	2009-10	2010-11	2011-12
BME		x	x	x	x
EE/CE		x			x
ME/EEN		x	x	x	
MSTE					x
CIT			x		
CGT		x	x	x	
ART		x		x	x
IDT		x		x	x
TCM		x	x		
OLS		x			x
ECET			x	x	x
MET		x			x
BMET			x		
CEMT		x	x	x	x
MAT			x	x	
NSAAC		x	x		

DEPARTMENT OF BIOMEDICAL ENGINEERING 2011-12 ASSESSMENT REPORT NARRATIVE
Written May, 2012

In the 2011-2012 academic year, the Biomedical Engineering (BME) department reached a major milestone and continued to make progress toward several other learning outcomes goals.

Major Milestone

In September 2010, the undergraduate BME program underwent its initial program accreditation visit by ABET, Inc., the accrediting body for engineering and technology programs. The Executive Board convened late last summer to review all programs visited in the previous year and to make final accreditation decisions. As of August 2011 the undergraduate BME program at IUPUI is officially ABET-accredited for the full six years until the next general review. To ensure that we continue to monitor learning outcomes and make systematic program improvements, we have developed a six-year plan that will allow two full (3-year) cycles of data collection, assessment, and improvement before the next ABET visit.

Task	Frequency	Scheduled			
ABET visit	6 years	Fa 2010	n/a	Fa 2016	n/a
Assessment plan review/ a-k outcomes data collection	3 years	Su 2011/ 2011-12	Su 2014/ 2014-15	Su 2017/ 2017-18	Su 2020/ 2020-21
a-k Outcomes Assessment		Su 2012	Su 2015	Su 2018	Su 2021
Alumni Survey/Focus Group		Fa 2012	Fa 2015	Fa 2018	Fa 2021
Student Satisfaction Surveys		Sp 2013	Sp 2016	Sp 2019	Sp 2022
Self-Study	6 years	n/a	2015-16	n/a	2021-22

Table 1: Schedule of ongoing assessment activities for the undergraduate BME program

Ongoing Outcomes Assessment and Improvement

Following the above schedule, in Summer 2012 the BME faculty undertook a full program-wide assessment of ABET outcomes. Prior to the 2011-12 academic year, faculty in each required undergraduate BME course identified specific exam questions, assignments, or other student learning artifacts closely aligned with the outcome(s) to be assessed in that course, and set an expectation of performance (e.g. "70% of students will score at least 70% on each assessed problem"). Graded copies of each assessed artifact were saved and assessment scores tallied. The department chair and the chair of the BME assessment committee then met with each faculty member individually to discuss the results, whether the assessment revealed any areas of weakness or targets for improvement, and possible course or program changes that might improve learning outcomes.

Improvements Since the Last Assessment Cycle

In 2009, the last time a program-wide outcomes assessment was undertaken, students assessed at the senior level were not meeting performance expectations for ABET Outcome M: "Students will demonstrate the capacity to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve problems at the engineering/biology interface." Three exam questions in BME 42200, Biofluid Mechanics, were used to assess this outcome, with the expectation that if students were successfully meeting the learning outcome, at least 70% of the class should score 70% or higher on each question. Instead, only 27%, 20%, and 33% of students, respectively, scored over 70% on these three problems – well below the target. In the

intervening three years, several changes have been made to the program in order to improve students' mathematical and analytical preparation for upper-level engineering courses, including a reorganization of the engineering calculus sequence to place more emphasis on linear algebra and multidimensional analytic geometry, and a change of instructor and increase in rigor in BME 22200, Biomeasurements, the first BME course in the curriculum. As a result of these and other changes, this year's seniors performed significantly better on Outcome M, with 61%, 65%, and 78% of students, respectively, scoring at least 70% on three assessed exam problems. Although there is still some room for further improvement, this represents a significant increase in attainment of this learning outcome.

In fact, there is general agreement among the faculty that our students are stronger analytically and better prepared to be successful engineers than they were three years ago. Even in courses that were already meeting their learning outcomes goals three years ago, data collected during this cycle shows an increase in overall attainment of many outcomes. This increased attainment is particularly evident in the steadily improving quality of capstone design projects, as assessed each year by a panel of BME faculty. This year, even the lowest-rated projects were comparable in quality to some of the best projects of three years ago. Moreover, feedback from industry about the performance of our graduates in the workplace has been strongly positive, with several companies (including Midwest Orthotics, Covance, and the medical imaging division of FujiFilm) actively recruiting additional interns and new hires from our program after observing first-hand the workplace effectiveness of IUPUI BME graduates. Finally, ongoing data collection on BME students taking upper-level electives in other engineering departments (e.g. ME, ECE) reveals that the students feel that they are as well-prepared as their classmates who completed their prerequisite coursework in those other departments. Although the flavor of instruction and emphasis of topics varies between programs as appropriate to the discipline, both student perceptions of their preparedness and their demonstrated ability to succeed in these out-of-area classes shows that BME students are well-grounded in core engineering knowledge and skills.

Targets for Future Improvement

In BME 33400 Biomedical Computing, assessment results demonstrated that overall, students met attainment goals for all three learning outcomes assessed in that course (Outcome G, ability to communicate effectively; Outcome K, ability to use the skills, techniques, and modern engineering tools necessary for engineering practice; and Outcome M as described above). 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. Currently the BME department teaches a section of BME 22200 Biomeasurements at Butler, specifically for the EDDP students (although IUPUI students willing to drive to Butler can also enroll; a typical enrollment for this section is 10-12 EDDP students and 2-3 IUPUI students). We are soliciting feedback from current EDDP seniors and recent graduates as to whether the Butler students might be better served by integrating with their IUPUI peers earlier in the program by taking BME 22200 and perhaps also ENGR 29700, the 1-credit MATLAB course, as a single cohort in a BME-specific section.

Other suggestions for improvement based on the most recent assessment results include:

- In the Senior Design sequence, many "soft skills" (such as Outcome H, understanding the impact of engineering solutions in a global, economic, environmental, and societal context, and Outcome J, knowledge of contemporary issues) are being assessed based on

whether these issues are addressed in students' preliminary and final design reports. In future semesters, students will be given more explicit instructions to include a discussion of these issues in their reports, and a more quantitative rubric will be used to assess the depth and appropriateness of the discussion.

- Currently students in Senior Design present their work to a faculty panel for evaluation in the middle of the second semester and at the conclusion of the two-semester sequence. In future years, students will be given an additional opportunity at the end of the first semester or beginning of the second semester to present to and get feedback from the faculty assessment panel. It is hoped that an earlier opportunity for presentation and feedback will help students work more quickly toward prototype development and testing, as well as giving the panel another opportunity to assess their progress.
- In order to give students more opportunity to develop their skills related to Outcome N, the ability to make measurements on and interpret data from living systems, a cell imaging laboratory experience will be added to BME 35400, Problems in Cell/Tissue Behavior and Properties.
- The faculty teaching biomechanics-oriented courses (BME 24100 Intro Biomechanics, BME 35400, and BME 46100 Biofluid Mechanics) will meet to ensure that mechanics topics are well-distributed across the curriculum.
- In BME 38300 Problems in Implantable Materials and Biological Response, a materials lab will be revised so that students have to apply some engineering analysis in order to design a material with particular properties, rather than simply being given a set of instructor-determined parameters to use. This will help them develop skills related to Outcome C, ability to design a system, component, or process to meet desired needs with realistic constraints.

Finally, with a number of reorganizations taking place within the School of Engineering and Technology, much of the administrative responsibility for graduate programs is moving from the school level to the departmental level. The BME department is taking advantage of this transition to improve a number of processes related to student recruitment and admission as well as program assessment. In the spring semester, the BME graduate committee drafted templates of acceptance letters that will make it easier to communicate early with strong candidates about opportunities for research and teaching assistantships, in the hopes that these funding opportunities will help attract top candidates to enroll in the program. In addition, the BME graduate committee and assessment committee are working together to improve outcomes assessment. Previously, members of a candidate's thesis committee would fill out evaluation forms to assess the outcomes demonstrated in the written thesis and oral defense, and submit these forms to the school's graduate office. These forms will now be kept in the department to facilitate systematic data analysis and program improvement.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
2011-12 PROGRAM REIVEW AND ASSESSMENT REPORT

During the 2011-12 academic year, the Department of Electrical and Computer Engineering continued its regular assessment activities, which are conducted each semester. There were also changes made in some courses to improve student attainment of course outcomes.

Each course has specific course outcomes that are mapped to the student outcomes used for ABET assessment and accreditation purposes. The student outcomes are mapped to the university's PULs. In the 2011-12 AY, students completed course outcome surveys to give feedback on their level of attainment of the outcomes. Overall, the students' assessment of their learning met the department's goal of 3.5 on a 5 point scale. Instructors for the classes also completed the course outcome surveys, using the same scale to rate student achievement, based on student performance. Faculty have not yet implemented changes based on this year's results.

Improvements put into place based on survey results and student performance during current and prior semesters include the items listed below.

ECE 27000 Introduction to Digital System Design

- The timing and composition of the labs were changed so that they are better aligned for student learning and retention. The longer labs were split into multiple smaller labs to ensure the students were keeping up with the lab material. Result: The lab instructor was pleased with the student's improvement from fall, and grades on the labs improved. Exam questions relating to labs also improved success. The lab instructor is also re-working lab components of this class, along with labs in courses that build on this introductory course, to improve the learning flow through this series of classes.

ECE20800 Electronic Devices and Design Laboratory

- This course has been updated. We replaced about 50% of the experiments with new ones. The change was necessary for two reasons: 1. to go along with the ECE25500 (associated lecture) materials, and to update to new and appropriate materials. The new material was covered in Spring 2012 and summer 2012. Student performance in both ECE20800 and ECE25500 was improved in Spring 2012 and Summer 2012 semesters.

ECE 30200 Probabilistic Methods in Electrical and Computer Engineering

- In both Fall 2011 and Spring 2012, a course project component was added to the course, which closely relates the course material to daily life applications of probability theory. The changes were made as part of a sponsored NSF project to study how student projects can enhance student learning. The students really like these course projects, and expressed that the projects truly help them understand the concepts better and make connections between theory and practical applications. Faculty assessment of improvement in student learning as a result of the added projects is ongoing.

ECE48700 & ECE48800 Senior Design I and II.

- The number of industry-sponsored projects was increased for this two-semester capstone course series. During the past year more than 70% of the projects came from local industry. This gave the students experience working on a real-world project, determining and meeting the needs of an external customer, and in some cases using

the product development processes mandated by their sponsor. The feedback from sponsors has been good, and there is an increase in the number of students receiving offers of full-time employment from their sponsors.

- A Ph.D. student from the department was employed as a knowledge resource for the students. The student was available during regular class hours, and could help students think through their ideas and project problems. The effect of this service will be assessed in Fall 2012.
- Project completion dates will be adjusted during the next year. In previous semesters, some projects were not completed and tested in time for necessary adjustments to be made. The completion date will be earlier, allowing time for more product improvements and testing before the end of the semester.

ECE 32600 Project Management for Engineers

- Many changes were made in the structure of the course in the Spring 2012 semester, and student and instructor feedback indicated a high level of satisfaction with the course and with student attainment of course outcomes. Faculty assessment of student work samples before and after the changes is ongoing.

Student Mentoring

- In the Spring 2012 semester a student mentoring program was implemented, in collaboration with the E&T New Student Academic Advising Center. Upperclass students are trained and employed as mentors for freshmen and new transfer students. They have physical space in the advising center, and serve as a resource for students adjusting to college and engineering study. The goal of the program is to increase the retention rate of freshmen engineering students. Data is not yet available on this new program.

2011-2012 Annual Assessment Report
Construction Engineering Management Technology (CEMT)

Program Review and Assessment Committee (PRAC)
Department of Engineering Technology
Purdue School of Engineering & Technology
Indiana University Purdue University Indianapolis

June 22, 2012
J. William White

Overview

Assessment highlights for this past academic year include

- CEMT faculty met on May 21, 2012 to review critical curriculum issues. Topics included:
  - Increase plan reading skills within the curriculum. It has been noted that students repeatedly request additional experience in plan reading.
  - Consideration of TECH 104 content. The ENT Department is considering an alternative class which focusses exclusively on CEMT-specific topics instead of the technology overview it currently presents. The reappraisal of TECH 104 content offers an opportunity to incorporate additional plan reading exercises.
  - Strategies to reduce the current total degree hours from 124 credit hours to 120 as mandated by the State of Indiana.
- The ENT Department has adopted an electronic format for assessment documentation. An Acrobat Portfolio format is being used to retain all of the documentation for each course including examples of student work. Currently the documentation is being utilized primarily for full time faculty submissions; adjunct faculty submitted course reflections via e-mail to the department.
- The ENT Department has changed the course reflection form to simplify its execution. The new form is simpler to execute and includes space for comments from course coordinators.
- The content of the capstone student project presentation to the CEMT Industry Advisory Board (IAB) was altered. In lieu of students presenting specific details about their projects, a summary of each student's undergraduate experience was presented. This content generated a good dialogue between the students, faculty and IAB members relating to the CEMT program.

Data Collection

The method for collecting data has changed to an electronic format located on the school's shared G: drive. As this is the first semester for its deployment, documentation and contribution methods continue to be refined. For the purposes of this report course reflections were summarized to identify overall trends in the program. Refer to Figure 1.

Analysis

Out of 25 courses taught in the Spring 2012 semester, 12 were taught by adjunct faculty. At the time of this writing, 68% of adjunct instructors had submitted course reflections. Of those adjunct instructors who had taught their course previously, 86% indicated that course material was changed to improve student performance and/or the in-class experience.

The program appears to be responding to student requested hands-on experience by increasing plan reading skills (CEMT 280), manual construction experience (CEMT 120) and realistic problem solving (CEMT 499). Additional experience is planned for the upcoming semester (CEMT 455).

2011-2012 Annual Assessment Report

Construction Engineering Management Technology (CEMT)

CEMT Course Reflection Review Summary Spring 2012			
	Course # Instructor	***Title***	***Changes, Proposed Improvements***
1	104 Kinsey	Survey Fundamentals	*2011: Subsurface utility engineering (SUE) will be considered for course content.*
2	110 Stull*	Construction Accounting	2012: Confirmed course is sufficiently challenging, textbook is appropriate and facilities met expectations. Requested an improved instructor computer for ET 006.
3	120 Johnson*	Construction Materials & Methods	*2011: Relocate projector & screen in lab to improve visibility.*
			2012: Screen & projector moved. Changes: Added references to MS Excel & Project, added in-lab hands-on wall framing exercise. *Proposed improvements:* 1) Increase discussion regarding government constraints and codes & standards to improve comprehension; 2) Increase interactive discussion to enhance clarity.
4	160 Betancourt*	Statics	
5	215 Homer*	Mechanical & Electrical Systems	2012: Moved homework assignment to in-class to facilitate coaching, absence of laboratory is a problem. *Proposed improvements:* increase relevance, instrument reading skills,
6	260 Kinsey	Strength of Materials	
7	267 Kinsey	Materials Testing	*2011: Asphalt material may be added to the list of reviewed materials.*
8	275 Koo	Civil Engineering Drafting	*2011: Reduction in lab enrollment size will be considered to enhance lab time instruction.*
9	280 White	Quantity Take-Off	*2011: CD reading component added; use of digital take-off tools increased, use of Excel increased, MS Project offered as a scheduling tool.*
			2012: CD reading component significantly supplemented with extra credit OnCourse assessment feature within five (5) labs.
10	302 Easter*	Construction Law & Ethics	*2011: Instructor will be revising content to increase student challenge.*
			2012: Supplemental topics added: liability associated with drafting, contract negotiation. "Art of negotiation" in-class exercise effective and popular. Students have problems with writing ability. *Proposed improvements:* Increase focus & revise assignments on claim evaluation.
11	312 Kuhn*	Construction & Route Surveying	*2011: GIS / GPS technology will be added into the course content.*
12	330 Sener	Field Operations	2011: New textbook has been adopted which adds telematics, trenchless technology and fleet balancing.
13	341 Iseley	Construction Scheduling & Project Control	2011: New textbook has been adopted, continuing reduction in manual scheduling methodology and increase study of MS Project.
			2012: Classroom assignments were increased. *Proposed improvements:* More time will be allotted for problem solving.
14	342 Litzinger*	Cost & Bidding	
15	347 White	Construction Administration & Specifications	2011: Lab exercises revised; software variables caused problems with the lab exercises. Software will be updated to Service Pack 5.

CEMT Course Reflection Review Summary Spring 2012			
	Course # Instructor	***Title***	***Changes, Proposed Improvements***
			2012: Software upgraded to SP5. A new version is now available and will be upgraded during Summer 2012. The semester project was revised extensively, making it more closely resemble an actual contract situation. Specifications and a Gantt chart were added to increase student exposure to these tools. *Proposed improvements:* Upgrade software to PCM 13.1 SP 2.
16	350 McCaan*	Cost & Control	
17	390 Iseley	Construction Experience	2012: No changes planned at this time.
18	430 Sener	Soils & Foundations	2011: Two (2) textbooks have been combined into one (1). Foundation design continues.
19	447 Rydell*	Project Management	2011: Proposed to eliminate textbook from course requirement and rely upon class lectures.
			2012: Textbook will be reconsidered for FA12. Changes: Several new in-class assignments, increased correlation between class lectures and exam content, added assessment metrics. *Proposed improvements:* Increase in-class team assignments and increase individual contribution assignments.
20	452 Sener	Hydraulics & Drainage	
21	455 Steinhofer*	Safety & Inspection	2012: Working with Pearson rep to update text. Also, 30 hour certification will be offered next semester (FA12)
22	484 Kinsey	Wood & Timber	
23	494 Kieser*	Construction Economics	2012: Changes: increased real-world examples and problem-solving exercises to enhance critical thinking.
24	499 White	Sustainability in Construction (Spring)	2011: Additional time spent with manual calculations appears warranted. Textbook re-evaluation is warranted.
			2012: Additional calculations were included with more LEED credit point calculations
25	499 White	Innovation in Construction (Fall)	
26	499 Williams*	Land Development	2012: Inaugural semester. Text is appropriate; supplemental resources were posted. Students' writing skills need improvement.

Figure 1. CEMT Course Reflection Summary.
*adjunct facul

DESIGN TECHNOLOGY ASSESSMENT REPORT
Interior Design Technology and Architectural Technology
Prepared by Emily McLaughlin
June 2012

Overview

The underlying objective of the Design Technology (DST) programs is to create multidisciplinary individuals with the necessary skills to enter the technology driven industries of the new millennium. Classroom knowledge links applications to the field through multiple service-learning activities with community partners, and student learning is regularly measured and assessed using PUL and ABET/CIDA outcomes, as well as industry feedback.

During the 2011-2012 academic year, the unit labeled Design Technology demonstrated the commitment to best practices by examining the IUPUI Principles of Undergraduate Learning, ABET criteria and CIDA professional standards, as well as evaluating assessment techniques used to measure learning outcomes related to these principles.

Assessment Initiatives

Over the past year, our programs have participated in a multitude of new and ongoing activities relative to continuous assessment and evaluation of program inputs and outcomes. The following summarizes our most significant efforts, yet is not meant to be all inclusive.

1. Implemented a New Course Assessment Report Requirement

In January of 2012, the Interior Design Technology and Architectural Technology programs designed a new course assessment report (CAR) which is now required to be completed by both full and part-time faculty for every course in the department.

The report requires that the faculty member record prescriptive information for the course, such as the instructor, textbook and course objectives, as well as comment on the success of the objectives (ie: were they met?), any modifications made to the course based on previous semesters feedback, and modifications proposed for future semesters.

Identification of strengths and gaps in curriculum has been a regular department meeting topic of discussion. The information gathered has been used to precisely identify key indicators of student outcomes. While there are a multitude of simple changes that have taken place as a result of these meetings, some significant changes include the removal of 7 credit hours from the plan of study in an effort to meet State mandate of 120 credit hours.

2. Reorganized INTR/ART Industrial Advisory Board

Our advisory board membership was almost entirely exchanged in the fall of 2011 in an effort to solicit guidance from modern individuals who provide value to our programs. Our highly involved advisory board, consisting of both local and national authorities, provided invaluable criticisms through four, half-day retreats which were held over the past year. It is with their insight and recommendations that several aspects of our plans of study are consistently

scrutinized and revised to ensure validity with professional practice and to make certain that program goals remain current.

3. New Senior Exit Surveys

In April of 2012, new senior exit surveys were created, collected and analyzed by the faculty and have brought about simple changes based on the recommendations of those who have completed our entire curriculum. As a result of student feedback, the faculty took steps to evaluate the computer graphics curriculum component of our programs, examine the courses which offer curriculum via hybrid and online formats, and make changes to program curriculum as needed.

4. Sophomore Advancement Review

The Interior Design Technology program continued to implement a sophomore advancement review. All students in the program who intend to pursue a B.S. degree must participate in this exercise, which involves the compilation of an academic portfolio and written statements, and the presentation of this work to a group of faculty who then deliberate without the student present. This exercise has proven to not only offer the student valuable criticisms regarding their academic progress, but also provide the faculty with an assessment mechanism which can be used to ensure that program outcomes are being met at the freshman and sophomore levels specifically.

5. Student Design Show

The Student Design Organization at IUPUI again held an annual show in March which showcased student work to the committee, including local design professionals who judged the work, providing valuable written and oral feedback to the students and faculty. This event provides useful guidance regarding professional expectations, in addition to allowing the faculty to view as a group the outcomes of student work across the entire curriculum. As a result of this event, presentation format of student produced work has been altered, and graphics skills/software needs of the program have been altered and increased.

PRAC Report – Academic year 2011-12
Department of Engineering Technology
(Includes BMET, ECET, CEMT, MET, and MSTE)

Department wide "Program Enrichment Project"

In the Fall, 2011 semester, Matt Ray, one of our staff members, evaluated our assessment data collection and associated processes and applied Lean/6-sigma techniques for improvement. Matt used interviews, focus groups, and surveys to determine the current process and its strengths and opportunities for improvement. Based on this input, he developed a new electronic method of collecting course assessment data utilizing Adobe portfolios.

Every class has its own portfolio with the following sections:

1. Instructions
2. Course Objectives
3. Assessment Assignments
4. Midterm evaluation (for new faculty)
5. Rubrics which might be used to assess the course objectives or PULs
6. Instructor reflection form
7. Sample student work

Some of the sections are populated by the course coordinator, and others are completed by the instructor of record. The course coordinator is responsible for reviewing the portfolio at the end of the semester.

The new portfolio system was beta tested in fall 2011 and pilot tested with full time faculty during the spring 2012 semester. The new system does a better job organizing all the information about courses, and will be invaluable during our preparations for ABET accreditation next year.

ECET (EET and CpET) programs

Comparison of ABET assessment data and PUL data

Last year it was reported that the program had decided to discontinue student assessment surveys since the faculty would be reporting PUL effectiveness to the campus. The PUL data was compared to assessment assignment data for similar student outcomes in ECET classes, and the results published[1]. The study found that there is not a strong correlation between the PUL and student outcome data, but that might be because of the scale used to evaluate the PULs is different than that of the outcomes. Additional work will be done to revise the rubrics used to evaluate the outcomes so that they match the PUL scale used by the campus. This will streamline the faculty efforts and provide consistency.

[1] Bastian, Kristine Paradis, Eugenia Fernandez, and Elaine M. Cooney "Accreditation Reciprocity: Interchangeability Challenges Between Broadly Defined and Narrowly Defined Student Assessment Methods" Proceedings of the 2012 Annual Conference of the American Society for Engineering Education.

2011-2012 Annual Assessment Report
Mechanical Engineering Technology (MET)

Department of Engineering Technology
Purdue School of Engineering & Technology
Indiana University Purdue University Indianapolis

July 16, 2012
P. R. A. Yearling

Overview

Assessment highlights for this past academic year include

- MET faculty met on April 12, 2012 to review critical curriculum issues. Topics included:
  - Industrial Advisory Board meeting content and timeline
  - Strategies to reduce the current total degree hours from 127 credit hours to 120 as mandated by the State of Indiana
  - Senior Assessment Exam review and results. The average score for 2012 was reported as57.42% with a standard deviation of 8.08%
- MET Industrial Advisory Board met on April 27, 2012 to review the MET curriculum and MET 414 capstone design project. Topics discussed included:
  - Review and request for feedback concerning the 120 credit hour change
  - In response to previous IAB recommendation, introduction of common design themes into the MET curriculum.
  - Introduce Lean Six Sigma certificate program
  - An overview of the MET 414 final year course to include local industry based projects.
  - As proposed by Carrier MET 388 will be expanded into three courses, MET220 Thermodynamics, MET 320 Heat and Power, and MET 375 Heat Transfer.
- The ENT Department has adopted an electronic format for assessment documentation. An Acrobat Portfolio format is being used to retain all of the documentation for each course including examples of student work. Currently the documentation is being utilized primarily for full time faculty submissions; adjunct faculty submitted course reflections via e-mail to the department.
- The ENT Department has changed the course reflection form to simplify its execution. The new form is simpler to execute and includes space for comments from course coordinators.

Data Collection

The method for collecting data has changed to an electronic format located on the school's shared G: drive. As this is the first semester for its deployment, documentation and contribution methods continue to be refined.

Analysis

Out of 22 MET, IET, and TECH courses taught in the Spring of 2012 semester, 9 were taught by adjunct faculty. Based on instructor and Industrial Advisor input changes to individual classes and assessment methods will be initiated in the Fall 2012, Table 1.

Table 1, Overview of future enhancements to the MET curriculum.

Course	Overview
MET 414	Design of Mechanical Projects will be based on local industry based projects. In addition, students will have the option of applying Lean Six-Sigma methods in the project design, management, and presentation phases.
	Senior Assessment Exam results will be reviewed and the individual core disciplines will be trended over time.
MET 388	As a result of consultation with Industrial Advisory Board members MET 388 will be split into three courses: • Introductory Thermodynamics MET 220 (Heat and Power) • Intermediate Thermodynamics MET 320 (Applied Thermodynamics) • Heat Transfer Met 375
MET 338	To enhance student involvement MET 338 Manufacturing Processes will feature a single project based on the design and manufacture of an Oscillating Steam Engine. Common design elements of the steam engine will be incorporated into MET 220 (Heat & Power), MET 320(Applied Thermodynamics), MET 370 (Heat Transfer), MET 213 (Dynamics), and MET 204 (Introduction to Design).

Motorsports Engineering: Assessment Processes

The Motorsports Engineering (MSTE) program accepted its first students as incoming freshmen in 2008. The program currently enrolls 80 students and produced its first graduates in May, 2012. It is anticipated the MSTE program will apply for ABET accreditation with the next general review of IUPUI's engineering programs in 2016. Accordingly, the program focuses on assessment of the learning outcomes defined by ABET as crucial for all engineering programs, with subtopics appropriate to Motorsports:

a. Demonstrate and apply knowledge of mathematics, science, and engineering with:
    a1. Knowledge in chemistry and calculus-based physics in depth
    a2. Mathematics through multivariate calculus, differential equations, and linear algebra
    a3. Probability and statistics
    a4. Mechanical engineering sciences: solid mechanics, fluid-thermal science, material science
b. Design and conduct experiments methodically, analyze data, and interpret results
c. Design a system, component, or process to meet desired needs with applications to:
    c1. Mechanical systems
    c2. Thermal systems
d. Function in teams to carry out multidisciplinary projects
e. Identify, formulate, and solve engineering problems
f. Understand professional and ethical responsibilities
g. Communicate effectively, in writing and orally
h. Understand the impact of engineering solutions in a global and societal context through broad education
i. Recognize the need to engage in lifelong learning
j. Demonstrate knowledge of contemporary issues
k. Use the techniques, skills, and modern tools of engineering effectively and correctly in engineering practice with:
    k1. Mechanical engineering analysis tools (e.g.,ANSYS, ProMechanica, etc.)
    k2. Engineering design and manufacturing tools (e.g., ProE)
    k3. Internet and library resources
    k4. Mathematical computing and analysis tools (e.g Matlab, Excel, LabView, Minitab, etc.)

The Motorsports assessment plan closely follows the processes previously established for assessment of the Mechanical Engineering program. Each required course in the curriculum has defined course-specific learning outcomes that are mapped both to the corresponding ABET outcome(s) and to the PULs, as shown in the table below. In addition, for each outcome, appropriate learning artifacts are identified for assessment. At the end of each semester, faculty complete an Outcomes Survey (direct measure) to determine whether course outcomes were met in their own courses, as well as a questionnaire which encourages reflection regarding course objectives, textbook and course notes, level of the content and challenge to students, and future directions and variations which should/might be considered. Students also complete a self-assessment (indirect measure) asking them to assess their own mastery of each course outcome. Course coordinators and the department chair review the data periodically to identify

any areas of weakness or targets for improvement and to propose and implement necessary changes.

Outcomes: **Upon completion of the BS degree, students will be able to:**	**ABET** (defined above)	**PUL**	**Assessment methods**
1. Demonstrate knowledge and skills in the use of the design and analysis of mechanical systems as encountered in the degree program's courses. Demonstrate a working vocabulary and knowledge of industry safety requirements and regulations as encountered in the degree's program classes.	a	1d, 1e, 3b, 4a	a. Students complete a "self-assessment" survey each semester to evaluate course objectives which are mapped to this outcome. Goal: 70% of students will agree or strongly agree (4/5) b. Specific questions demonstrating knowledge and comprehension will be included on final exams in targeted classes: the instructors should use the same/similar questions semester-to-semester, submit any changes in question(s) to the assessment committee one month prior to the final exam. Scores on the specific questions should be reported to the assessment committee each semester. Goal: 70% of students will score 70% or better on each question
2. Use current knowledge of mathematics, science and emerging MAE tools to solve problems and demonstrate solutions.	b	2a, 2b, 2d, 3c, 4a, 4c	a. Students complete a "self-assessment" survey each semester to evaluate course objectives which are mapped to this outcome. Goal: 70% of students will agree or strongly agree (4/5) b. Specific questions demonstrating application of mathematics in targeted classes will be included on final exams: the instructors should use the same/similar questions semester-to-semester, submit any changes in question(s) to the assessment committee one month prior to the final exam. Scores on the specific questions should be reported to the assessment committee each semester. Goal: 70% of students will score 70% or better on each question
3. Identify, analyze and integrate technical requirements with the needs of the industry as required in the degree program's courses.	f	1b, 1d, 2a, 2b, 2c, 2d, 4a, 4c	a. Students complete a "self-assessment" survey each semester to evaluate course objectives which are mapped to this outcome. Goal: 70% of students will agree or strongly agree (4/5) b. Specific questions demonstrating analysis in targeted classes be included on final exams: the instructors should use the same/similar questions semester-to-semester, submit any changes in question(s) to the assessment committee one month prior to the final exam. Scores on the specific questions should be reported to the assessment committee each semester. Goal: 70% of students will score 70% or better on each question
4. Apply and design solutions for issues identified in industry as	d	2b, 2d,	a. Students complete a "self-assessment" survey each semester to evaluate course

demonstrated in a senior project.		3c, 4a, 4c, 6b	objectives which are mapped to this outcome. Goal: 70% of students will agree or strongly agree (4/5) b. The design rubric will be filled out by the faculty member assessing the senior design project. Goal: 70% of students score a 3 or above on all items
5. Conduct, analyze and interpret experiments, gather data, and assess results.	c	1b, 2a, 2c, 2e	a. Students complete a "self-assessment" survey each semester to evaluate course objectives which are mapped to this outcome. Goal: 70% of students will agree or strongly agree (4/5) b. A lab practical test will be given in targeted classes. Goal: 70% of students will pass test
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.	e	1c, 5c	a. Targeted courses will assess teaming. In each case, the teaming rubric will be filled out by the faculty member assessing the success of their teams. Goal: 70% of students score a 3 or above on all items b. A teaming rubric will be filled out by each student (self / peer evaluation) in targeted classes. Goal: 70% of students score a 3 or above on all items
7. Write technical reports; present data and results coherently in oral and graphic formats.	g	1a, 1c, 3a, 5c	a. Written reports will be evaluated in targeted classes using departmental written report rubric. Results will be collected. Goal: 70% of students score a 3 or above on all items b. Oral reports will be evaluated in targeted classes using departmental oral report rubric. Results will be collected. Goal: 70% of students score a 3 or above on all items
8. Demonstrate skills for life-long learning by locating, evaluating and applying relevant information using external resources such as the Internet, data books, trade publications and library resources.	h	3a, 5c	a. Research strategies will be presented in course work Goal: Recognition of strategies by 70% of students b. Assignment to assess the validity of websites using rating scale in targeted classes. Goal: 70% of students have a majority of references that score 12 or above on the rating scale c. Demonstrate use of library resources for research Goal: 90% of students have references; 70% have references that go beyond data books or internet sources (e.g. technical journals or conference proceedings).
9. Demonstrate ethical conduct as described in the university student code of conduct. Demonstrate	i	2a, 3b, 5b, 6a	Educate students of expectations in targeted classes; require review of Student Code of Conduct and Statement on Civility.

knowledge of professional code of ethics.			a. In targeted classes, evaluate student work using turnitin.com to check for plagiarism Goal: 90% of students show 10% or less plagiarism as measured by turnitin.com b. Survey all full time faculty and any part time faculty teaching targeted classes regarding student ethics and civility Goal: 90% of courses report 4/5 or better on each item c. Students will review the ASME Code of Ethics in targeted classes.
10. Demonstrate a respect for diversity as described in the university civility statement. Recognize contemporary professional, societal and global issues in case studies and course projects.	j	2e, 3b, 3c, 4b, 5a, 5b, 5c, 6a	Require review of Student Code of Conduct and Statement on Civility in targeted classes. a. Survey faculty regarding student ethics and civility (items 1, 2, & 5 on rubric) Goal: 90% of courses report 3 or better on each item b. The instructors should use the same/similar questions semester-to-semester. Scores should be reported to the assessment committee each semester. Goal: 90% of students will score 70% or better. c. Students will complete a case study including global perspective. Goal: 90% of students will identify at least one globally significant aspect of the scenario.
11. Demonstrate quality, timeliness and ability to complete increasingly complex homework and projects throughout the degree experience	k	1e, 2e, 4c, 6a	a. Collect results of design project completion. Goal: 70% of students get a 4 or better. b. Choose 2 assignments in targeted classes. Record the number of students turning the assignment in on time, late, and not at all. Students are not to know which assignments are being counted. Goal: 80% of assignments will be turned in on time (expect % on time to increase with course level.) c. Assess milestone / Gantt charts for each student project in the senior project course Goal: 70% of students are no more than 1 milestone points behind schedule d. Assess quality of design of senior projects. Goal: 70% get 4 or better.

As the department grows and begins to produce graduates, several other assessment methods will be implemented to supplement the information available from direct course-level outcomes assessment:

Departmental survey of continuing students: Overall satisfaction, availability of advising, faculty accessibility, quality and access to laboratories, computing, faculty office hours,

opportunity to get to know other students, quality of course materials, and the opportunity to get to know faculty members will be evaluated by students in targeted classes each semester.

Exit Survey: This survey will be given to each graduating student. They will be asked to self-assess their mastery of each of the program outcomes.

Departmental survey of recent graduates: Graduates will be surveyed (about 6 months after graduation) to determine their satisfaction with the department, satisfaction with individual faculty members as well as questions regarding how well the program prepared them for the job market.

Employer Survey: Employers of MSTE graduates will be surveyed to compare program outcomes, employee success and actual work responsibilities.

Motorsports Engineering: Assessment Results and Recent Improvements

Although the program is still relatively young, several changes have already been implemented:

- Two new classes have been added to the curriculum based on feedback from the industry.
- Two existing classes are being modified based on feedback from the industry.
- Several classes are being relocated in the plan of study and prerequisites are being altered appropriately based on feedback from students and faculty observations.

Assessment Activity in Organizational Leadership and Supervision

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Since 2010, the Organizational Leadership and Supervision (OLS)

- Developed a master rubric for all OLS courses that tie course-level learning outcomes to the IUPUI Principles of Undergraduate Learning (PULs)

- Identified specific assignments in core OLS courses that demonstrate the specific learning outcomes defined for each course

- Trained faculty on how to utilize the rubrics to evaluate student work

- Facilitated a process for faculty to upload representative student work products into a dedicated Oncourse site to provide evidence of student learning, done in large part to support the accreditation needs of other departments elsewhere in E&T

- Completed the relevant PUL evaluation roster in support of the IUPUI campus-level reaccreditation

- Used the results of assessment activities to make targeted improvements in course content, delivery, and assignments

In addition to regular course-and program-level assessment activities, OLS has been engaged in an intentional focus on assessment of prior learning for adult, veteran, and returning students in AY 2011-12. Through an externally-funded grant received from the Military Family Research Institute, OLS faculty have:

- Created mechanisms for the assessment and articulation of prior learning based on the recommendations from the American Council on Education

- Developed a course and review process for development of a prior learning portfolio for evaluation of specific courses related to the OLS curriculum

- Engaged faculty from other E&T departments in the process of faculty evaluation of prior learning

- Held a conference focused on veteran and adult learning, which principally focused on the needs, resources, and approaches related to prior learning assessment

- Disseminated the results of the prior learning assessment process and outcomes to various national peer-reviewed outlets (e.g., Council for Adult and Experiential Learning; American Association for Behavioral and Social Science; National Academic Advising Association)