# Annual Report for Assessment of Outcomes 2012-13

Subject Area Committee Name: Civil and Mechanical Engineering Technology
Contact person: Jan Chambers
For LDC/DE: Core outcome(s) assessed: _____
For CTE: Degree or certificate* assessed: CMET Associate's Degree
*please attach a table showing the alignment of the degree or certificate outcomes with the College Core Outcomes

Please address the questions below and
send to *learningassessment@pcc.edu* by **June 21, 2013** with Annual Report in the subject line

*Note: Information provided in this report may be inserted into or summarized in Section 2C Program Review Outline.*

1. Describe changes that have been implemented towards improving students' attainment of outcomes that resulted from recent outcome assessments. These may include but are not limited to changes to content, materials, instruction, pedagogy etc. Please be sure to **describe the connection** between the assessment results and the changes made.

In the Annual Report for Assessment of Outcomes 2011-12 document, the CMET SAC noted that, in the Final Projects, there should be 'a requirement for the student groups to state which course they acquired which skills.' Also, there should be 'estimated cost information and a bill of materials included in all Final Projects.' Both of these components were required of the students as shown in the CMET 223 Project Management Team Project Spec Sheet in the Appendix. These components improved the quality and coherence of the Final Projects.

Also, in the Annual Report for Assessment of Outcomes 2011-12 document, the CMET SAC believed 'that the results of Outcome 3 (visualization skills) can be improved by reiterating the importance of including AutoCAD and Solid Works drawings in the written report.' In 2011-2012, Outcome 3 (visualization skills) had an average score of 2.72 with a standard deviation of 1.091 (a score of 2 indicates 'Developing', while a score of 3 indicates 'Accomplished'). In 2012-13, Outcome 3 (visualization skills) had an average of 2.7 with a standard deviation of 0.194. Therefore, there was not an improvement in this Outcome 3 assessment. This will be addressed further in Section 4 of this document.

**For each outcome assessed this year:**

2. Describe the assessment design (tool and processes) used. Include relevant information about:
   - The nature of the assessment (e.g., written work, project, portfolio, exam, survey, performance etc.) and if it is direct (assesses evidence mastery of outcomes) or indirect (student's perception of mastery). Please give rationale for indirect assessments (direct assessments are preferable).
   - The student sample assessed (including sample size relative to the targeted student population for the assessment activity) process and rationale for selection of the student sample. Why was this group of students and/or courses chosen?

- Any rubrics, checklists, surveys or other tools that were used to evaluate the student work. (Please include with your report – OK to include in appendix). Where appropriate, identify benchmarks.
- How you analyzed results, including steps taken to ensure that results are reliable (consistent from one evaluator to another.

For 2012-13, the CMET SAC assessed Outcomes 1, 3, and 4 of the CMET Program Outcomes. The CMET Program Outcomes are listed below:

1. Apply fundamental engineering knowledge to identify, formulate and design successful solutions to real-world technical endeavors.
2. Utilize appropriate laboratory techniques, engineering equipment and computational technology to collect, analyze, and interpret data to acquire scientific knowledge about a stated problem.
3. Utilize the knowledge of visualization skills, computer aided drawing programs and the ability to create and interpret engineering drawings, to design engineering projects within proper industry acceptable standards and conventions.
4. Apply effective communication skills, teamwork, project / time management, ethical engineering practices, and professional responsibility to the development of engineering components and systems.
5. Practice sustainable engineering methodologies.

Outcomes 1 (engineering fundamentals), 3 (visualization skills), and 4 (communication) were assessed directly by all 5 faculty of the CMET SAC. The faculty assessed both the presentations and written reports of the CMET 223 Project Management class. These projects are similar to a Capstone-type project for CMET. This same assessment approach was used successfully in 2011-12 and, therefore, was repeated. Having all 5 full-time CMET faculty members attending and observing the 'Final' Project presentations has created a sense of gravity and importance for the presentations, a feeling of the last hurdle before graduation for the students. Part-time CMET faculty members, EET faculty, the Engineering Technology Advisor and the Engineering Administrative Assistant have also attended the presentations in the past 2 years. Assessment of Program Outcomes has caused us to create and continue what is becoming an endearing tradition of closure for the CMET program.

The student sample size was the entire population of the class which included nearly all of the graduating class. There were 10 groups for a total of 39 students with one group excluded for Assessments due to this particular group going beyond the appropriate scope of the project and, therefore, not completing essential components of the project that were to be assessed.

On Monday, June 10$^{th}$, 2013, the CMET 223 Project Management presentations were given and the CMET SAC used the 'Faculty Scoring Rubric for Program Assessment based on CMET 223 Project Management Final Team Presentations' to assess Outcomes 1 (engineering fundamentals) and 4 (communication). The written reports were examined in a separate meeting to score Outcome 3 on the same rubric. Each of the criteria was scored on a 4-point scale: 1 = Beginning or Incomplete, 2 = Developing, 3 = Accomplished and 4 = Exemplary. Each of the student groups were evaluated independently by each CMET SAC faculty without any knowledge of the other faculty members' scores. As shown in the '2012-13 Assessments Data' spreadsheet in the Appendix, the scoring was reasonably consistent from one faculty to another.

3. Provide information about the results (i.e., what did you learn about how well students are meeting the outcomes)?
    - If scored (e.g., if a rubric or other scaled tool is used), please report the data, and relate to any appropriate benchmarks.
    - Results should be broken down in a way that is meaningful and useful for making improvements to teaching/learning. Please show those specific results.

As shown in the 2012-13 Assessments Data' in the Appendix, for Outcome 1 (engineering fundamentals), the average score was 2.7 with a standard deviation of 0.254. This was very similar to the Outcome 1 score of 2011-12 of 2.94, with both indicating an overall rating close to 'Accomplished'.

For Outcome 3 (visualization skills), the average score was 2.7 with a standard deviation of 0.194. This was virtually identical to the score of 2011-12 of 2.72. Since this was an area that was explicitly "flagged" in the 2011-12 assessments, it was a little disappointing to see this nearly-identical result. This result indicates a need for us to continue to emphasize this area.

For Outcome 4 (communication), the average score was 2.9 with a standard deviation of 0.419. This score was somewhat lower than the score of 2011-12 of 3.33.

We would like to see improvement from year to year in these assessment scores, so the flat nature (in one case a decrease) of these scores was somewhat disconcerting. These results inspired vigorous discussions on what can be done in 2013-14 to send the trend of the Assessment scores in a positive direction.

4. Identify any changes that should, as a result of this assessment, be implemented to help improve students' attainment of outcomes. (These may include, but are not limited to, changes in curriculum, content, materials, instruction, pedagogy etc).

As referenced in Section 3, the CMET SAC faculty discussed what methods to help the students' attainment of the CMET Program Outcomes.

First and foremost, it was suggested that we have a 'Pre-Final Project Pow-wow' to focus our energy and insight on what we would like to see accomplished with the Final Project. This meeting (or meetings) would cause us to revisit this document and ensure that the Final Project contains the elements of the Outcomes that will be assessed. In addition, it was thought that the students should be required to consult with previous instructors regarding material from previous courses that are contained within their Final Project. This would keep the entire CMET SAC involved and focused on the Final Projects rather than just the Instructor of CMET 223 Project Management.

It was also suggested that the scale of the Final Project be more narrowly focused. Some groups 'went all out', and spent many hours working, sometimes unsuccessfully, to make their product. Most groups cited that lack of time was preventative in completing all of their tasks. This was the primary reason that the CMET SAC felt that the scores of Outcome 1, 3, and 4 were slightly lower than in 2011-12.

Finally, it was recommended that the students produce a handout, including sample calculations and significant drawings to give the audience. The CMET SAC faculty had a difficult time assessing some of the presentations due to not being able to decipher some of the calculations.

5. Reflect on the effectiveness of this assessment tool and assessment process. Please describe any changes to assessment methodology that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome). Is there a different kind of assessment tool or process that the SAC would like to use for this outcome in the future? If the assessment tool and processes does not need to be revised, please indicate this.

Besides the changes listed in Section 4, the CMET SAC faculty do not plan to alter the assessment tool (the Final Project) used for Outcome 1 (engineering fundamentals), Outcome 3 (visualization skills) and Outcome 4 (communication).

In 2013-2014, the CMET SAC faculty plan to revisit Outcome 2 (lab skills) and Outcome 5 (sustainable engineering). The assessment tool that will be used to accomplish these Outcome assessments will be an analysis of a lab write-up from CMET 211 Environmental Quality in the Winter quarter. The CMET SAC faculty also plan on a 'pre-lab write-up' meeting to discuss the details of a successful assessment of Outcomes 2 and 5.

**Appendix**

1) CMET 223 Project Management Team Project Spec Sheet
2) Faculty Scoring Rubric for Program Assessment based on CMET 223 Project Management Final Team Presentations
3) 2012-13 Assessment Data
4) Alignment of the Degree Outcomes

2012-13 Assessment Data

| Faculty1 | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Team 9 | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| Outcome 1 | 4 | 1 | 1 | 3 | 3 | 3 | 2 | 1 | 3 | 2.3333 |
| Outcome 3 | 4 | 4 | 2 | 2 | 4 | 3 | 2 | 2 | 3 | 2.8889 |
| Outcome 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2.4444 |

| Faculty2 | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Team 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Outcome 1 | 4 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2.6667 |
| Outcome 3 | 4 | 3 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 2.5556 |
| Outcome 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3.2222 |

| Faculty3 | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Team 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Outcome 1 | 4 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2.7778 |
| Outcome 3 | 3 | 3 | 3 | 1 | 2 | 3 | 1 | 3 | 4 | 2.5556 |
| Outcome 4 | 4 | 4 | 4 | 3 | 3 | 4 | 2 | 3 | 3 | 3.3333 |

| Faculty4 | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Team 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Outcome 1 | 4 | 3 | 4 | 1 | 3 | | 3 | 2 | 3 | 2.8750 |
| Outcome 3 | 3 | 3 | 3 | 1 | 3 | | 2 | 2 | 3 | 2.5000 |
| Outcome 4 | 4 | 2 | 3 | 2 | 2 | | 2 | 2 | 3 | 2.5000 |

| Faculty5 | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Team 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Outcome 1 | 4 | 3 | 4 | 3 | 3 | 2 | 2 | 3 | 3 | 3.0000 |
| Outcome 3 | 4 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2.8889 |
| Outcome 4 | 4 | 3 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 3.1111 |

| Outcome 1 Average | Outcome 1 Standard Deviation |
|---|---|
| 2.7 | 0.254 |

| Outcome 3 Average | Outcome 3 Standard Deviation |
|---|---|
| 2.7 | 0.194 |

| Outcome 4 Average | Outcome 4 Standard Deviation |
|---|---|
| 2.9 | 0.419 |

# CIVIL AND MECHANICAL ENGINEERING TECHNOLOGY
# ASSOCIATE OF APPLIED SCIENCE DEGREE OUTCOMES

| MET AAS OUTCOME | ALIGNED PCC CORE OUTCOME |
|---|---|
| Apply fundamental knowledge of mathematical, computational, scientific and engineering concepts to identify, formulate and design successful resolutions to real-world mechanical or manufacturing engineering problems. | Critical Thinking and Problem Solving<br>Professional Competence<br>Communication |
| Utilize appropriate laboratory techniques, engineering equipment and computational technology to collect, analyze, and interpret data to acquire scientific knowledge about a stated problem. | Critical Thinking and Problem Solving<br>Professional Competence<br>Communication |
| Utilize the knowledge of visualization skills, computer aided drawing programs and the ability to create and interpret engineering drawings, to design machines and manufacturing processes within proper industry acceptable standards and conventions. | Critical Thinking and Problem Solving<br>Professional Competence<br>Communication |
| Apply effective and efficient communication skills, teamwork that fosters inclusion, project and time management skills, ethical engineering practices and professional responsibility in order to plan, design, fabricate, construct and operate engineering systems or components. | Critical Thinking and Problem Solving<br>Professional Competence<br>Community and Environmental Responsibility<br>Cultural Awareness<br>Communication |
| Practice sustainable engineering methodologies. | Critical Thinking and Problem Solving<br>Professional Competence<br>Community and Environmental Responsibility<br>Cultural Awareness |

| CET AAS OUTCOME | ALIGNED PCC CORE OUTCOME |
|---|---|
| Apply fundamental knowledge of mathematical, computational, scientific and engineering concepts to identify, formulate and design successful resolutions to real-world civil engineering problems. | Critical Thinking and Problem Solving<br>Professional Competence<br>Communication |
| Utilize appropriate laboratory techniques, engineering equipment and computational technology to collect, analyze, and interpret data to acquire scientific knowledge about a stated problem. | Critical Thinking and Problem Solving<br>Professional Competence<br>Communication |
| Utilize the knowledge of visualization skills, computer aided drawing programs and the ability to create and interpret engineering drawings, to design civil engineering projects within proper industry acceptable standards and conventions. | Critical Thinking and Problem Solving<br>Professional Competence<br>Communication |
| Apply effective and efficient communication skills, teamwork that fosters inclusion, project and time management skills, ethical engineering practices and professional responsibility in order to plan, design, fabricate, construct and operate engineering systems or components. | Critical Thinking and Problem Solving<br>Professional Competence<br>Community and Environmental Responsibility<br>Cultural Awareness<br>Communication |

| | |
|---|---|
| Practice sustainable engineering methodologies. | Critical Thinking and Problem Solving<br>Professional Competence<br>Community and Environmental Responsibility<br>Cultural Awareness |

**Faculty Scoring Rubric for Program Assessment based on CMET 223 Project Management Final Team Presentations**

| CMET Outcomes 1, 3, & 4 | Exemplary (4) | Accomplished (3): More like Exemplary, but missing several key factors | Developing (2): More like Beginning / Incomplete, but demonstrates substantial learning progress | Beginning or Incomplete (1) |
|---|---|---|---|---|
| **1. Apply fundamental engineering knowledge to identify, formulate and design successful solutions to real-world technical endeavors.** | ☐ Specifically addresses a minimum of four CMET-taught technical skills drawing from a minimum of two CMET courses<br>☐ Learnings are clearly articulated both visually and orally during the team project presentation<br>☐ Technical aspects of project are sound and demonstrate job-ready skills<br>☐ Project stretched student's technical learning beyond that which was learned during prior CMET coursework<br>☐ Team report met all critical elements as specified in the class-assigned spec sheet | | | ☐ Connection between the project and CMET program education was vague, or missing<br>☐ Technical aspects portrayed were dubious in nature<br>☐ Project choice did not address a real-world technical endeavor |
| **3. Utilize the knowledge of visualization skills, computer aided drawing programs and the ability to create and interpret engineering drawings, to design engineering projects within proper industry acceptable standards and conventions.** | ☐ Project is supported by professional-grade CAD drawings<br>☐ Accompanying visuals clearly depict key functional attributes of the project<br>☐ Accompanying models and/or prototypes were displayed and explained in a manner that clearly depicted the project objectives and constraints<br>☐ Accompanying visuals were compelling in nature | | | ☐ Missing supporting CAD drawings<br>☐ Supporting sketches messy<br>☐ Physical props missing or very poorly displayed<br>☐ Accompanying visuals lacked interest |
| **4. Apply effective communication skills, teamwork, project / time management, ethical engineering practices, and professional responsibility to the development of engineering components and systems.** | ☐ Project slideshow succinctly captured critical project elements including: Purpose, methodologies, teamwork, CMET learnings, Proj Mgmt learnings (e.g. Schedule, Scope, Resources)<br>☐ Presenters addressed the audience at all times using the slideshow for content augmentation. Presenters did not turn their backs to the audience and parrot back information off of the slides<br>☐ Presentation "discussion portion" reinforces CMET learning details through the effective use of props, models, prototypes, audience readable graphics<br>☐ Teamwork and reflection are discussed in a manner that conveys deep learning took place<br>☐ Presenters engaged audience through surprise, humor, prompts, responsive Q&A<br>☐ Attire, body language, and speaking all depicted a high degree of professionalism | | | ☐ Slideshow was disorganized and uninteresting<br>☐ Presenters talked to the slides rather than addressing the audience<br>☐ Professional attire was missing from most or all of team<br>☐ Presenter(s) stumbled frequently as they addressed the audience<br>☐ Team showed poor body language<br>☐ No proactive prompting of audience for Q&A<br>☐ Minimal evidence of CMET and/or Project Management learning was shown |

| **CMET Outcomes 1, 3, & 4** | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Team 9 | Team 10 | Average | Std. Dev. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Apply fundamental engineering knowledge to identify, formulate and design successful solutions to real-world technical endeavors.** | | | | | | | | | | | | |
| **3. Utilize the knowledge of visualization skills, computer aided drawing programs and the ability to create and interpret engineering drawings, to design engineering projects within proper industry acceptable standards and conventions.** | | | | | | | | | | | | |
| **4. Apply effective communication skills, teamwork, project / time management, ethical engineering practices, and professional responsibility to the development of engineering components and systems.** | | | | | | | | | | | | |

## CMET 223 Project Management  Team Project Spec Sheet

### Project Deliverables:

1. A finished team project that embodies at least *four* total technical skills taught in at least *two different* CMET classes.
   Examples: (1) Drawings/3D models made in a CAD class, (2) Stability assessment using Statics equations, (3) Buoyancy requirements learned in Fluids, (4) Proper selection of hardware per Machine Design, (5) Deflection determination from Strength of Materials

   *Your finished project must demonstrate tangible & impressive results*

2. A professional-grade project report which includes the following elements:
   a. A spiral binding
   b. A cover which includes a graphical representation of your project, title, team names, & course info
   c. A written Charter signed off by your instructor
   d. A Project Plan including all key elements described by textbook (e.g. schedule plan, risk plan…)
   e. A CMET Learnings section which thoroughly and professionally details your work from Deliverables #1
   f. A one-page written team reflection summarizing the project process, challenges, and team dynamics

   *Each team must publish several finished copies: One for each team member plus one for your instructor to keep on file*

3. Weekly status updates
   - Sent by team leads (note revolving responsibilities per project phase)
   - Sent to gmeyer.pcc@gmail.com
   - Written in memo-style format addressed to: Gregg Meyer, PCC Engineering. Weekly updates to include (1) Status, (2) Plans, (3) Issues. Do not include as an attachment (text in body of email plus attachments as required). Memo should be between ½ and 1 full page when printed with 1" margins and 11 pt. font.

4. Presentations
   - Practice Practice Practice
   - 10-15 minutes plus time for Q&A
   - Dress professionally
   - Connect with your audience
   - Slides should only support your presentation, not BE your presentation
   - Convince your instructor, peers, and visiting faculty that your accomplishments were achieved through (1) CMET curriculum, and (2) Project Management fundamentals

### Schedule Milestones:

| Date | Milestone |
|---|---|
| 4/9 (week of) | 1st 10 minute meeting with instructor as team for project approval. Be prepared to elaborate on why you are suggesting "this project" over at least 2 other ideas (i.e. bring a decision matrix; see instructor for details). Also be prepare to make your arguments as to how this project will achieve at least 2 of the 4 tech skills. |
| 4/16 (Tu) | 30 second elevator speech describing your project and how you chose it (ensure it meets deliverable #1) |
| 4/18 (Th) | First weekly status update due |
| 4/19 (Fri) | Change of leadership command (make personal notes to assess how well 1st leader performed). Project transitions from INITIATION to PLANNING |
| 5/6 (week of) | 2nd 10 minute team meeting with instructor. Be prepared to demonstrate evidence your project is ~50% complete. Change of leadership command (leader #3). Begin formal EXCUTION phase. |
| 5/28 (Tu) | Change of leadership command from EXECUTION to CLOSING |
| 6/4 (Tu) | Written project due |
| 6/6 (Th)* | Final project presentations |

* *Date of final presentations subject to change due to faculty availability*

| **Project Leadership Duties* :** | **Grading Breakdown:** | |
|---|---|---|
| Phase I: Presentation #1, Charter sign-off, Memo #1 | Initial Concept Presentation | 10% |
| Phase II: Completion of Project Plan | Weekly status updates | 20% |
| Phase III: Getting the project itself done | Tangible Outcome (eg "thing" or "plan set") | 20% |
| Phase IV: Report and Final Presentation | Project Report | 25% |
| • These duties are not necessarily going to be in sync with the changing of commands. They are full ownership. | Team Presentation | 25% |