

## ***Sibley School Procedure for Assessing Capstone Design Courses***

### **GOAL**

The goal of this document is to implement a mechanism for regular assessment and feedback for the Sibley school's capstone design elective courses and for the team projects and independent projects that satisfy its capstone design requirement. The ABET outcome relevant to the senior capstone design experience is:

- c) an ability to design a system, component, or process to meet desired needs.

Each course or project must satisfy this outcome in a way which causes each student to have a major design experience that is based upon the knowledge and skills acquired in previous course work and that incorporates appropriate engineering standards and multiple realistic constraints.

### **ASSESSMENT RULES AND PROCEDURES**

#### 1. Schedule:

These regular assessments will be conducted bi-annually. In a given 2-year period, they will be conducted during the same two semesters in which ABET assessments are performed for the school's other courses.

#### 2. Design Courses that must be Assessed:

- a) All senior design versions of existing courses, that are used to satisfy the school's capstone design requirement.
- b) All team projects that are used by some of the participants to satisfy their capstone design requirement.
- c) All independent projects that are used by some of the participants to satisfy their capstone design requirement.

#### 3. Required Written Assessments.

A written ABET assessment must be prepared by every instructor of a capstone design course or project as defined in Part 2.

For each Senior Design version of an existing course, the instructor must prepare one assessment that rates the achievement of ABET outcome "c" for the student or students who passed that course with a grade of C- or better and who had the lowest level of achievement of the outcome. This lowest level of outcome achievement does not necessarily correspond to the lowest grade received because grading may take additional factors into account.

Each separate team project must receive a separate assessment. Note, however, that individual student experiences do not generate separate assessments if multiple students participated in a capstone design project team that produced a single final report. In the case of multiple students on a team, the instructor's outcomes assessment must rate the achievement by the student or students whose achievement of the outcome was the lowest among those students who received a grade of C- or better for the project. The instructor will make the determination for this (these) student(s) based on documentation of the individual students' efforts as recorded on the design report cover sheet and as may be recorded in the design report.

Each instructor of independent projects must produce a single assessment of one project, the one whose achievement of the outcome was the lowest. Thus, if a faculty member advises two or more separate independent capstone design projects that result in two or more separate reports, then he or she performs one assessment. This assessment applies to the worst of the projects in terms of outcome achievement (not necessarily in terms of grade). As with team projects, individual student experiences do not generate separate assessments

if multiple students participated in the capstone design project that was the poorest at achieving the capstone design outcome. In the case of multiple students on that project, the instructor's outcomes assessment must rate the achievement of the student or students whose outcome achievement was the lowest among those students who received a grade of C- or better for the project. The instructor will make the determination for this (these) student(s) based on documentation of the individual students' efforts as recorded on the design report cover sheet and as may be recorded in the design report.

The assessment must cover outcome "c" given above and must assess the degree to which the course or project has satisfied the major design experience criteria given directly after outcome "c".

The following standard documentation will be cited by each instructor in support of his or her assessment: The signed design report content summary form and the actual design report.

An example assessment is appended to the end of this document. It may be used as a template for preparing written assessments of capstone design courses, team projects, and independent projects. Note that the required assessment may be as brief as the appended document.

4. Presentation of Capstone Design Assessments to the Sibley Faculty and Feedback from the Faculty:

Every capstone design instructor, as defined in the first paragraph of Part 3, must present his or her assessment report to a meeting of a group of the Sibley school faculty so that the faculty can provide feedback. This presentation will normally take place at one of the school's regular end-of-semester ABET course assessment meetings. Normally two such meetings occur during each of the 2 semesters out of 4 that constitute assessment semesters. Every capstone design instructor will attend one or the other of these meetings. Each instructor will make an informal oral presentation of his or her assessment and of any recommended improvements to the capstone design course elective or project. This presentation need not involve the preparation or delivery of any visual presentation materials such as power-point slides.

The Sibley faculty will provide verbal feedback to the capstone design course instructors as appropriate.

These meetings will be documented. The oral assessments and any verbal feedback may be recorded by electronic means or in a transcript of the meeting. The presenting design instructors are encouraged to make written notes about any feedback from the faculty. Minutes of each meeting will be generated. These minutes will record which courses and projects have been assessed and who presented the assessments. The written course assessments will be appended to the meeting minutes.

APPENDIX: EXAMPLE WRITTEN ASSESSMENT (MAY BE USED AS A TEMPLATE)**MAE 4021, Supervised Senior Design Experience Version of MAE 4020, Wind Power, -- Course Outcomes Assessment and Improvement Plan Based on Fall Semester 2013**Course Outcomes and Mapping to MAE/ABET outcomes:

On completion of this course, students will have demonstrated:

1. an ability to design a system, component, or process to meet desired needs (MAE/ABET outcome c). This outcome must be satisfied in a way which causes each student to have a major design experience that is based upon the knowledge and skills acquired in previous course work and that incorporates appropriate engineering standards and multiple realistic constraints.

(The achievement of this outcome will involve demonstration of an ability to design a basket to meet specified functional requirements and performance objectives, taking into account the real-world constraints of materials availability, local manufacturing capabilities, and labor costs, considering alternative design concepts, and conforming to the published basket design standards of the South Polynesian Association of Structural and Mechanical Engineers (SPASM), "The Basket Code". Achievement of this outcome will also involve the use of skills learned in earlier course work in order to conduct mass-properties, finite-element, and fatigue analyses of basket designs that assess whether they meet requirements for weight, strength, and durability)

\* \*

**ASSESSMENT**

The level of attainment of the course outcome has been assessed by the instructor based on the evidence of the students' final written design reports and based on the school-mandated cover sheets for these reports. This raw data was reviewed and interpreted on a scale of 1 to 3, with the following meanings: 1- not achieved, 2 - partially achieved, 3 - fully achieved. This assessment applies to the student or students who completed this design course with the lowest attainment of this course's outcome. The assessments and the supporting evidence are as follows:

Course Outcome	Achievement Rating	Evidence
1	2.5	Design reports and cover sheets.

**IMPROVEMENT PLAN IN RESPONSE TO OUTCOME ASSESSMENT**

1. The partial weakness in the outcome was the result of too much emphasis on alternative designs at the conceptual phase, which left too little time for in-depth analyses of a few promising designs. This partial weakness will be addressed in future versions by starting a parallel effort to analyze suggested example designs while alternative conceptual designs are being considered. The early designs will be chosen to be marginal candidates for final adoption, such as a cantilevered half-handle design. This strategy will compel the students to conduct analyses earlier in the course and thereby become more conversant with the analysis tools. This change will not bias their final choice of a conceptual design because their analyses of the initial example designs will demonstrate that they perform at marginal to inadequate levels.

**Person who prepared this assessment and date of preparation:**

Mark L. Psiaki  
Dec. 22, 2008