OVERVIEW

Participants demonstrate their ability to use the technical design process to solve an engineering design problem.

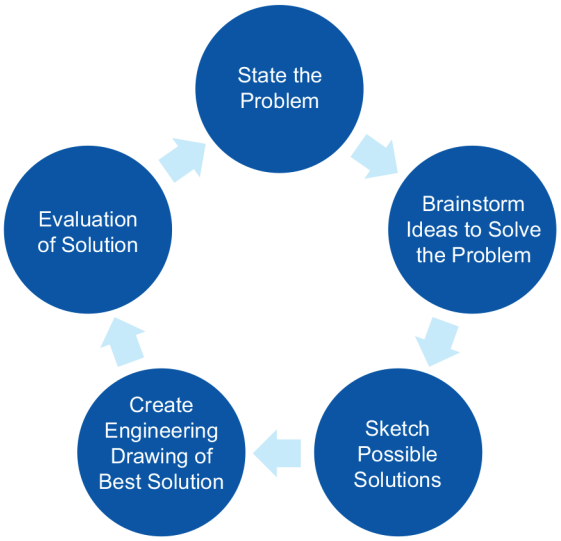
REGULATIONS

A. Students will prepare a portfolio that includes each step of the technical design process loop. (Figure 1). The first step will be to develop a problem statement interpretation from the problem provided. The portfolio should show a logical progression from one step of the loop to the next.

B. Documentation materials (comprising a "portfolio") are required
The report cover must include the following pages, in this order:

1. Title page with the event title and student ID number, one (1) page
2. Table of contents; one (1) page
3. Students interpretation of the problem, including a list of criteria and constraints set forth in the design brief; one (1) page.
4. Demonstrated use of a brainstorming technique of the students choice (mind mapping, reverse engineering, word association, ect) to develop ideas to solve the problem; brainstorming ideas should be documented; one (1) page
5. At least three (3) hand-drawn sketches of different solutions to the given problem; each hand-drawn solution should be developed based on the selected brainstorming technique; each hand-drawn sketch also should include a solution pro/con list written on each sketch to aid in selecting the best design; one (1) page for each hand-drawn sketch; three (3) pages total
6. Based on the pro/con list for each of the hand-drawn solutions to the problem, select the best solution and create an engineering drawing based on the solution; one (1) page
7. Using the engineering drawing of the final solution, write a paragraph that evaluates the final solution and answers the following question, “Does the final design meet all the elements set forth in the design brief?’; one (1) page

Figure 1. Technical design process loop



DESIGN BRIEF

Problem:

Many professionals have a desk that has limited space for supplies, laptops, monitors, and other materials. Design a storage system that is no larger than 10"x12"x12" that can hold pencils/pens, office supplies, cell phones, a 20 FL OZ water bottle, and additional items that you desire. Considering the potential for condensation with fluids, select the best material for the solution. The solution can be numerous smaller parts of the same shape/size that can be joined as desired to form a complete system withing the limits.

Participant/Team ID# _____

TECHNICAL DESIGN

2016 & 2017 OFFICIAL RATING FORM — MIDDLE SCHOOL

Solution (100 points)

CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points	Record scores in the column spaces below.
Evaluators: Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline, record the scores earned for the event criteria in the column spaces to the right. The X1 or X2 notation in the criteria column is a multiplier factor for determining the points earned. (Example: an "adequate" score of 7 for an X1 criterion = 7 points; an "adequate" score of 7 for an X2 criterion = 14 points.)				
Portfolio See Regulation B (X1)	Not all portfolio pages are included, and/or the pages are formatted incorrectly.	Most portfolio elements are included, organized, and formatted correctly.	Outstanding organization skills are evident in the preparation of the portfolio.	
Interpretation of problem (X1)	Interpretation of problem is vague, with few or no criteria/ constraints included in the description; statement is difficult to understand.	Interpretation of problem, criteria, and constraints are included and generally identified.	Interpretation of problem is well-developed and further investigates the included criteria/constraints.	
Brainstorming technique (X1)	There is no clear evidence of the use of brainstorming to interpret the design of the problem.	Use of brainstorming (which incorporates the problem statement, criteria, and constraints to solve problem) is apparent.	Exceptional and organized use of brainstorming (which incorporates each element of the design brief) is evident.	
Sketch 1 (X1)	Sketch is sloppy and ill-constructed, and/or it appears to be included as an afterthought to the design; there is no design pro/ con list, or it is incomplete.	Sketch is generally well drawn and includes the pro/con list; evidence of the final design is illustrated in the sketch.	Sketch is of exceptional quality and includes a creative pro/con list; clear transformation from the sketch to the final design is evident.	
Sketch 2 (X1)	Sketch is sloppy and ill-constructed, and/or it appears to be included as an afterthought to the design; there is no design pro/ con list, or it is incomplete.	Sketch is generally well drawn and includes pro/con list; evidence of the final design is illustrated in the sketch.	Sketch is of exceptional quality and includes a creative pro/con list; clear transformation from the sketch to the final design is evident.	
Sketch 3 (X1)	Sketch is sloppy and ill-constructed, and/or it appears to be included as an afterthought to the design; there is no design pro/ con list, or it is incomplete.	Sketch is generally well drawn and includes pro/con list. Evidence of the final design is illustrated in the sketch.	Sketch is of exceptional quality and includes a creative pro/con list; clear transformation from the sketch to the final design is evident.	
Final solution (X2)	Solution conveys a sloppy design, and/or does not incorporate key elements in the design brief, and/ or drafting techniques are not proper.	Solution incorporates most elements laid out in the design brief; drawing uses proper drafting techniques and methods.	Solution exudes creativity and addresses all design brief elements; proper drafting techniques are used in the design.	
Evaluation of design (X2)	Evaluation is sloppily written; it is a reiteration of the design brief elements, with little or no examination of the finished design.	Evaluation satisfactorially answers the question "Does the final design meet all the elements set forth in the design brief?"	Evaluation response is creative and unbiased; it is well written and answers the posed question completely.	
			SUBTOTAL (100 points)	