Engineering Foundation Year
Assessment and Feedback Specification

Unit: EFYODay

Title: Conceive Design Implement Operate (CDIO) Activity

Due: Thursday 26th February 2105.

Activity: The purpose of the CDIO Activity is to provide you with important information about engineering and Engineering Foundation Year by engaging you in the engineering design process with imposed constraints. You will be able to network with professional engineers and staff about university and engineering, in particular, the engineering design process and professional expectations. The task involves conceiving, designing, implementing and operating an engineering model solution to meet design constraints. The task will involve measuring, recording, calculations, reflection and evaluation of the team process. Work in teams of 6 to 8 persons within your sub-group. Review and share the outcomes of each sub-group teams.

For a detailed Assessment description and specification of work to be done refer to Instructions provided below here.

Assessment criteria and marking distribution and Engineers Australia competencies addressed
Value of the assessment based on the rubric provided below 40% for the CDIO Activity

The total assessment mark awarded is made up of the marks awarded to each element assessed. Each item of the assessment in the rubric shows the EA competencies (**ENGINEERS AUSTRALIA Stage 1 competencies**) to be demonstrated. 'Level of learning' (**Levels of learning**) is specified for those elements of the assignment when it is appropriate. Unit Learning Outcomes (ULOs) are also numbered in the Rubric.

Detailed guidelines and feedback
This detailed assessment rubric sets out assessment expectations so that you will be aware of the competencies to be developed and the expected standards. This table will also be used for assessing your work to provide sufficient feedback on how you performed against these standards. This sheet is **NOT** the assignment cover sheet.

Expected time required after completion of all necessary preparation to complete this assessment 2 hours of focused work per team member.

Rubric Summary:

Item	Engineers Australia competencies	Excellent standard	Moderate Standard	Needs Development	Mark
Design Solution **Evidence: calculations, drawings and model**	1.1 Science/Engineering fundamentals 1.5 Context 1.6 Engineering Practice 2.1. Problem solving 2.4 .Project management 3.2. Communication 3.3 Creativity	Drawings, calculations and model are complete, clear, consistent communication of design outcomes which address the context and requirements. Drawings represent a design that is constructed in the scale model, and meets requirements. Calculations set out with a clear logical format. Calculations annotated with comments, identifying marks, and sketches to explain design process. Assumptions are justified and confirmed. Final design clearly communicated, modelled and assessed.	Drawings, calculations and model are mostly complete, consistent communication of design outcomes which address most requirements. Plans and/or sections may be deficient in quantity to express design intent. Calculations are presented neatly, but the format is not consistent. Some comments/ sketches not clearly shown or missing, so that following the design process requires effort. Some ambiguity in the final design and uncertainty of functionality.	Drawings, calculations and/or model are unclear, incomplete and may be inconsistent with the communicated outcomes, and do not address most of the considerations. Plans and sections are inconsistent, incorrect and/or missing and unclear. Calculations are not presented neatly. Insufficient descriptive comments and sketches making it difficult to follow the logic used in the design process. Unclear assumptions. Final design not easily discernible or assessed.	25
Team work **Evidence: Team-work evaluation, response to questions and documentation #EFYODay if possible**	2.4 .Project management 3.2. Communication 3.3 Creativity 3.6 Teamwork	Team work documentation is a clear, well-structured exposition of effective team management, and evidences how all team members contributed to the design and evaluation. All team members can articulate their and others' roles and contributions.	Team work documentation is largely clear, and does not evidence how all team members contributed to the process, design and evaluation of the design. All team members can articulate their roles but not others' contributions.	Team work documentation is largely missing, and suggests little team collaboration, contributed to the process, design and evaluation of the design. Few team members can articulate their roles.	15

Overall mark awarded out of a maximum of 40

Comments **share your solution with two other sub-groups so that they can assess your work and offer feedback.**

Assessment description and specification of work: modified from Pipeline Challenge provided by TryEngineering - http://tryengineering.org/lesson-plans/pipeline-challenge

Introduction

The CDIO Pipeline Challenge activity explores how engineers work in a team to solve problems, such as planning a pipeline to deliver water, oil, or gas to a community. Some examples of pipeline projects are provided in Resources. Students learn how stakeholders, communities, economics, topography, distance, and materials to be transported impact engineering plans. Assistance is provided from student mentors working with the teams and staff / industry professionals acting as consultants who will be located in the EFY studio.

Task Description

Students work in teams to design a pipeline to transport water from one point on campus to another. Students develop a plan/drawing, execute their pipeline plan as a model, and evaluate the strategies employed by other student teams.

A pipeline is to be designed to use water from the koi pond (east of Building 102) to Henderson Court adjacent to Building 301 to a water feature (such as a fountain). The pipeline is required to supply water to a water feature and aerate the water at the end point. At the end point the water would be collected in a storage vessel and pumped back to the koi pond once it is filtered and aerated. You are to design the pipeline taking into account the physical constraints of the campus and any requirements of the project listed below. Your design is to be documented with drawings, calculations and team members' contributions. The design is to be presented and evaluated by constructing a scale model from materials supplied.

- No pumps allowed; the water must be gravity fed. http://www.calctool.org/CALC/eng/civil/hazen-williams_g
- The project is funded by the Student Guild who has limited financial resources so cost is critical; simply put, less cost will be required for the shortest working pipeline with the least amount of connections. http://www.infrastructurecost.com/Projects_List/~209_Mainline%20Pipeline
- Consider the physical constraints of the site – you will need to estimate distances, angles and change in elevation of the site. Estimate the error in your measurements or calculations. http://properties.curtin.edu.au/maps/
- What considerations would need to be met if the pipeline was constructed e.g. reservoir capacity, pipe diameter and materials, flow rate, loss of energy in pipes. http://iitg.vlab.co.in/?sub=62&brch=176&sim=1635&cnt=1

Reflection:

- What challenges did you face in executing your pipeline?
- How accurate were your estimates and model construction?
- Did you find you needed to rework your original plan when you began building the model? If so, how did your pipeline change?
- Which pipeline developed by another engineering team did you think worked best? Why?
- If your design were scaled up to a real pipeline, do you think you would need pumps to keep the materials flowing through your system? Why or why not? And, if so, how many pumps would you add, and where would you put them?
- Did you find that there were many ways to solve this challenge? If so, what does that tell you about the engineering designs of real pipelines?
- Do you think you would have been able to create a successful pipeline as easily if you had not been working in a team? What are the advantages of teamwork vs. working alone?
- Identify some of the EA competencies you feel you have achieved through completing this activity.
- How did the mentors and consultants assist in your completion of the task and reflection on your learning?

Additional Reading:

- http://www.pbs.org/wgbh/amex/pipeline/sfeature/
- Oil & Gas Pipelines in Nontechnical Language (ISBN: 159370058X)
- Piping and Pipeline Engineering: Design, Construction, Maintenance, Integrity, and Repair (ISBN: 0824709640)

Resources:

http://www.scienceimage.csiro.au/tag/water/i/6380/section-of-the-perth-kalgoorlie-water-supply-pipeline-near-merredin-wa-1976-/

http://pipeliner.com.au/news/water_pipeline_from_perth_to_kalgoorlie_1894_-1903/040096/

https://www.youtube.com/watch?v=2OsyUJQqte0

Student Resource http://tryengineering.org/sites/default/files/lessons/pipelinechallenge.pdf