

Introducing Design-Implement Experiences and Workspaces in Marine and Offshore Study Program

Background and objective

The project aims to support the marine and offshore study program in moving towards the direction of educating CDIO-ready engineering graduates. CDIO-ready engineering graduates can «*conceive-design-implement-operate* complex value-added engineering systems in a modern team-based environment». CDIO represent the essential skills which a practicing engineer should possess. Producing CDIO-ready engineering graduates is the “ultimate learning outcome” of an engineering study program. The objective of this project is to introduce design-implement experiences and workspaces for strengthening the engineer-students’ learning so that we can produce CDIO ready engineering graduates. This is achieved by performing the following: (i) Design-implement exercises: Introducing two or more design-build exercises; at least one will be introduced at a beginner level (semester 1 and 2) and at least one will be introduced at an advanced level (semester 3) and (ii) Design-implement workspaces: Improve the current workspaces and laboratories to support and CDIO activities.

Design implement exercises

The purpose of the exercises is to (a) provide learning through activities central to the process of developing new products and systems, (b) develop product process and system building skills and (c) apply engineering science. The exercises developed are (i) OFF515 – hydrostatic design of an offshore floating platform, (ii) OFF515 – conceptual design of an offshore field, (iii) OFF585 – design of a joint on an offshore topside structure and (iv) OFF550 – pressure budget design of a subsea field development. OFF515 and OFF585 are first year courses while OFF550 is a second-year course. Because of the late start up in the project due to the Covid pandemic, we were not able to roll out the exercises in autumn 2020. We plan to roll out the exercises in autumn 2021. We will perform a survey at the end 2021 to get feedback on these exercises.

Design-implement workspaces

The purpose of the workspaces is to (a) support the learning of product, process, and system building skills concurrently with disciplinary knowledge, (b) emphasize hands on learning, (c) allow students to directly engage in their own learning and (d) provide opportunity for social learning. We established a marine and offshore dedicated workspace that is centred around water tank testing activities. We procured the following equipment: (i) BlueROV2, (ii) drone autopilots, (iii) water tank, (iv) towing carriage upgrade and (v) necessary miscellaneous equipment. (i) and (ii) were purchased through the current project. (iii) and (iv) were purchased through revenues from external projects IMBM marine and offshore group performed in 2020. The workspace allows for marine and offshore centre student projects to be performed. To this date three successful projects associated with the workspace have been performed (see example projects below). The feedback from the students were very positive. The workspace also complements the existing workspaces at IMBM, e.g., 3D printing and machine labs. Further, student teams such as UiS Subsea are encouraged to use this workspace. The workspace can also be utilised for other purposes such as demonstration during open houses and high school activities. Lastly through the testing experience gained from this workspace, we are better positioned for stronger collaboration with regional industry players such as Tau Autonomy Centre.

Example projects

Three student projects related to the marine and offshore water tank were performed, (i) Design of a low-cost water tank using CFD, (ii) Tuning for robust and optimal dynamic positioning control in BlueROV2 and (iii) Design and build a scaled model for UiS Subsea Freight-Glider. All these projects emphasized heavily on development of design procedures, system level thinking, engineering analysis and implementation of the conceived and developed solution. The students gave very positive feedback on their learning experiences. Two of the projects were part of the students’ master theses and they received excellent grades. It is unfortunate that because of the Covid pandemic, we were not able to involve as many students in CDIO projects as we had hoped. With the pandemic situation easing now, we expect that there will be more student projects in the 2021/2022 season.