Combined Engineering Thesis

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Objective:

The objective of this project is to allow students in their final year of Software Engineering to experience working with engineers in other fields, like they would in the real world once they graduate. This proposal will be a starting point for many possible combined thesis projects between Software Engineering and other engineering fields such as Electrical or Biomedical.

Background:

It is common practice in the real world for engineers from different fields to work together in order to accomplish a certain purpose. Examples would be building a new kind of cell phone or a pace maker for the human heart. Another example would be constructing a robot that could be guided remotely by a computer with the software needed to achieve a required task. In general, any hardware that needs embedded or controlling software for it to function will require the combined work of software engineers and other kinds of engineers.

Approach:

This project will involve coming up with a thesis topic; such that the software engineering students will work on implementing the software for it, while the engineering students from the other discipline will work on their program's aspect of it. This will require the coordination between the Software Engineering Department, and the department of the other engineering field. The professors teaching the thesis course from both departments will have to work together on finding a suitable topic. The topic will have to be within the appropriate level of complexity that undergraduate students can work on.

To illustrate this idea we briefly discuss the robot example mentioned in the background section. Electrical Engineering students would create a robot and a remote control, while the Software Engineering students would write up the drivers and the software that would communicate with the robot through the remote.

This project will involve about three students from each field. Students will continue to take thesis lectures separately, but they will be allowed to meet at least once a week in a combined tutorial, where they can discuss information on the project. During the tutorial periods they will be passing specification and requirements back and forth in order to be capable of doing their part of the project. The tutorial will require two teaching assistants, one from each field.

The course code will remain as SFWR 4G06, and it will still be called "SOFTWARE DESIGN IV - CAPSTONE DESIGN PROJECT". It will also continue to be a full year course. However, the course description will change to the following:

"Students will be working in teams with engineering students from another field. Software Engineering students in one team will be working together to prepare the requirements, design, documentation, and implementation of the software related to the system while taking economic, health, safety, legal, and marketing factors into account. Students must demonstrate a working system and convincing test results."

A student will need to be registered in the final level of a Software Engineering program in order to be able to take this course. Anti-requisites for this course will still be SFWR ENG 4G03 and SFWR ENG 4H03. The course will require three hours a week for lectures, and two hours a week for tutorials. In the first hour of each tutorial the students will meet with all other members in their group to discuss the overall process. In the second hour they will meet only with the members from their own field to work on their domain related tasks. Students may decide to meet at other times depending on their preference, but this tutorial will assure that all students are available to meet in that hour, in addition to offering them any necessary help from the teaching assistants.

We feel that this project is not hard to implement at all. It can be adapted by next year if accepted. It is a very good starting point to possible future combined thesis projects between Software Engineering and engineering fields other than Electrical. It can be done with Biomedical Engineering for example. A suggested topic to work on with Biomedical Engineering would be implementing pace makers for the heart. All other kinds of systems requiring embedded or controlling software make good examples. Any kind of air-conditioning system or refrigerating system that Mechanical Engineering students might be working on is also a good example, since it will be requiring software for it to function.

Impact:

This project will have a beneficial impact on the students. Not only will it allow students from both fields to work on a project in their own field of study, but it will also give them the chance to communicate with students from another engineering field. This will not be maximizing the students' work loads at all, since they will only have to worry about their part of the project, like they currently do. It might, on the other hand, require an additional amount of work from the professors' side. Nevertheless, this change will make the project larger, much more interesting, and much closer to what the students will be dealing with in the real world once they graduate. McMaster University will therefore deliver better Engineers, much more confident in working with others, which will give McMaster a better reputation among other Canadian Universities. Therefore this project is one that is worth implementing.

Estimated Cost:

The cost this project introduces is negligible compared to the value of the experience the students will be gaining. The Faculty of Engineering currently provides all the material needed for the thesis project. There is also a sufficient number of computer labs in ITB that the students will be allowed to use. The only difference might be the additional one or two hours of tutorial where students from both fields will be meeting. This will require hiring two teaching assistants. It will also require a significant cooperation between the professors teaching the thesis course.