## **1. Description**

In a lecture at the beginning of this semester, we discussed some examples of disasters and project failures that were caused by "poor"" software engineering practices. In this project your team will investigate one of them in detail.

Prof. Nancy Leveson is a Professor of Aeronautics and Astronautics at MIT, and she is well known for her work on system and software safety. She wrote a paper on the Therac-25 radiation therapy machine. The failure of the Therac-25 project was one of the examples we discussed.

## **2. Tasks**

1. Read the [paper](http://sunnyday.mit.edu/papers/therac.pdf).
2. **(25 points)**: Write a report in a file called **report.pdf** that answers the following questions:
   1. What were the problems that were faced by hospital staff and patients?
   2. What were the software engineering causes of these problems? In particular, your answer needs to answer the following questions related to the actual causes:
      * What was the role of shared variables in causing the Tyler accidents?
      * What was the role of shared variables in causing the Yakima accidents?
      * What was wrong with the relationship between the user interface and the rest of the functional parts of the Therac-25 system?
   3. What might have prevented the problem? This may require some thinking; the information may not be directly available in the paper. In particular, your answer needs to answer the following questions:
      * How could agile software development processes (e.g., Scrum) be used to develop embedded software used to control medical devices while ensuring safety requirements are met?
        1. Test driven development
        2. Difficult to do with embedded software because hardware is not as malleable as software, you typically need a long term plan
      * Describe an alternative architecture, in particular the connection between the user interface and the functional parts of the system.
        1. Unclear warning messages
        2. Bad at communicating with customers
        3. Why is the UI a separate routine?

The paper should be at least 3 pages long (you can go up to 4 pages if needed), with 11 pt size, single spacing, and single column. The paper must show a Title, team number, and names of the participating authors at the top of the paper.

**Caution:** Using other's work as your own, allowing others to use your work as their own, is academic misconduct and is not tolerated. Academic misconduct also includes copying material found in another source, such as an article in a journal or found on the web including the Therac-25 paper you are reading, without proper citations and quotation marks.

## **3. Submission**

Submit the report (**report.pdf**) through Canvas, just once for each team. Please check to see that the file has actually been submitted, not just uploaded.