

CS 511
Formal Methods for High-Assurance Software Engineering
Homework Assignment 01

Out: 6 September 2024
Due: Thursday, 12 September 2024, by 11:59 pm

A few administrative issues for this assignment and all later assignments in CS 511 of Fall 2024:

- You need to open a Gradescope account, after which you need to add yourself to the CS511 roster for this semester. The entry code for CS511, Fall 2023, is `WWX2NW`.
If you want to read more on adding yourself to the CS511 roster, go to [Adding a Course](#).
- You also need to create a *GitHub repository* where you store your solutions for *coding exercises with LEAN_4*.
To create a GitHub repository, you need to open a GitHub account. Instructions for how to do this are at the following webpages: [Set Up a GitHub Account](#) and [Create a GitHub Repository](#).
- Typically, each weekly assignment consists of two parts:
 1. One part includes *hand exercises*, *i.e. pencil-and-paper exercises*, and
 2. One part includes *coding exercises* in LEAN_4.

And each of the two parts will consist of:

- `2 easy exercises`, and
- `1 demanding exercise`, which we will call a `problem`,

for a total of `4 easy exercises` and `2 problems` in each weekly assignment.

- Typeset your solutions with Latex to produce a single ‘.pdf’ file containing:
 1. All your solutions for the *hand exercises*, and
 2. Links to your *coding exercises*, which are stored in your GitHub repository. (You should insert the links as active, *i.e.* clickable, *hyperlinks* in your ‘.pdf’ file.)

It is the ‘.pdf’ file produced with Latex that you will submit in Gradescope.

You do not need to use any particular format in naming your ‘.pdf’ file, because Gradescope will keep track of who is submitting it. Nonetheless, it is nice to use suggestive names in case of a mishap and we need to recover your file. So, here is a possible naming:

<your last name>_<your first name>.hw01.pdf

For example, for myself, I would call my file ‘`kfoury_assaf.hw01.pdf`’.

Reminder about doing or not doing a term project:

This is a slight adjustment to what you need to do to satisfy the requirement of a *term project*:

- Either you choose a *term project* in consultation with Assaf and Aaron, in which case you only need to do the **4 easy exercises** in each weekly assignment,
- Or you choose to completely forego doing a *term project*, in which case you will have to do the **4 easy exercises** plus the **2 problems** in each weekly assignment.

1 By Hand

Exercise 1 [LCS, page 79]: Exercise 1.2.1. Do parts (h), (i), and (j). □

Exercise 2 [LCS, page 84]: Exercise 1.4.2. Do parts (g), (h), and (i). □

PROBLEM 1 [LCS, page 87]: Exercise 1.5.3. Do parts (b) and (c). □

2 With Lean_4

Exercise 3 Write the script of the LEAN_4 proof for Example 1.3.4 in Macbeth’s book. The book gives the “proof by hand” in full, but does not give its mechanized version in LEAN_4. □

Exercise 4 Write the script of the LEAN_4 proof for Example 1.3.9 in Macbeth’s book. Again here, the book gives the “proof by hand”, but does not give its mechanized version in LEAN_4. □

PROBLEM 2 Do Exercise 7, in Section 1.3.11, in Macbeth’s book. □